CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4 ENVIRONMENTAL CONSEQUENCES

Chapter 4 describes the environmental consequences of the alternatives to replace the Chemistry and Metallurgy Research (CMR) Building at Los Alamos National Laboratory. The impact on each resource area is evaluated for the three proposed alternatives: the No Action Alternative (2004 Chemistry and Metallurgy Research Building Replacement Nuclear Facility [CMRR-NF]); the Modified CMRR-NF Alternative; and the Continued Use of CMR Building Alternative. In addition, the analysis evaluates the impacts of two options under the Modified CMRR-NF Alternative: the Deep Excavation Option and the Shallow Excavation Option. Chapter 4 also describes the cumulative impacts of these alternatives when combined with other past, present, and future actions that could affect the region; mitigation measures; and resource commitments.

4.1 Introduction

The environmental impacts analysis evaluates potentially affected resource areas in a manner commensurate with the importance of the potential effects on each area. The methodologies used to prepare the assessments for the following resource areas are discussed in Appendix B of this supplemental environmental impact statement (SEIS): land use and visual resources; site infrastructure; air quality and noise, including greenhouse gas emissions; geology and soils; surface-water and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; human health; environmental justice; waste management and pollution prevention; and transportation and traffic. With the exception of the Continued Use of Chemistry and Metallurgy Research (CMR) Building Alternative, all alternatives would involve a significant amount of construction activity. All construction would take place on land already owned by the Federal Government and administered by the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) and, for the most part, on land that has already been disturbed by other DOE activities. This *Draft Supplemental Environmental Impact Statement for the Nuclear Facility Portion of the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR-NF SEIS)* addresses the potential effects associated with land disturbance that construction activities would have on air and water resources, as well as the effects on ecological, cultural, and paleontological resources and on socioeconomic conditions within the environment influenced by DOE's potential actions at Los Alamos National Laboratory (LANL). The potential effects on the health and safety of workers, the public, and the environment from postulated accident conditions are analyzed. In addition, this SEIS addresses the impacts of transportation of materials both on site and off site, as well as the impacts of construction-related traffic on the roads in and around LANL.

Activities expected to occur during normal operations under the alternatives would not be characterized by any significant release of effluent, radiological or nonradiological, hazardous or nonhazardous. Therefore, the effects on the health and safety of workers, the public, and the environment from normal facility operations are presented in detail in deference to public interest rather than as an indication of their significance. This is also true of the assessments presented for environmental justice and waste generation.

Chapter 4 is organized by environmental resource areas under each alternative. These sections include discussions of potential impacts on all environmental resources due to construction (except for the Continued Use of CMR Building Alternative) and operations for the proposed alternatives at LANL. Section 4.2 discusses the environmental consequences of the No Action Alternative, building and operating the 2004 Chemistry and Metallurgy Research Building Replacement Nuclear Facility (CMRR-NF) at Technical Area 55 (TA-55), in accordance with the preferred alternative described in the 2003 *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building*

Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS) and selected in the 2004 Record of Decision (ROD).

Section 4.3 discusses the environmental consequences of the Modified CMRR-NF Alternative under both the Deep Excavation and Shallow Excavation Options. Section 4.4 discusses the environmental consequences of the Continued Use of CMR Building Alternative.

Other sections of this chapter present additional information as follows:

- *Section 4.5, Facility Disposition:* This section discusses disposition of the existing CMR Building and the CMRR-NF.
- *Section 4.6, Cumulative Impacts:* This section discusses cumulative impacts at LANL and the surrounding region, as appropriate.
- *Section 4.7, Mitigation:* This section discusses mitigation measures that could reduce, minimize, or eliminate unavoidable environmental impacts.
- *Section 4.8, Resource Commitments:* This section discusses the resource commitments required for the proposed action, including unavoidable, adverse impacts; the relationship between short-term uses of the environment and maintenance and enhancement of long-term productivity; and irreversible or irretrievable commitments of resources.

4.2 Environmental Impacts of the No Action Alternative

4.2.1 No Action Alternative

This section discusses the potential environmental impacts associated with the No Action Alternative. Under the No Action Alternative, NNSA would have constructed and operated a new CMRR-NF at TA-55, adjacent to the Radiological Laboratory/Utility/Office Building (RLUOB), as analyzed in the 2003 *CMRR EIS* and selected in the associated 2004 ROD. The 2004 CMRR-NF would have been linked to RLUOB by a tunnel and to the TA-55 Plutonium Facility by another tunnel. Based on information learned since 2004, the 2004 CMRR-NF would not meet the standards for a Performance Category 3[1] (PC-3) structure as required to safely conduct the full suite of NNSA analytical chemistry and materials characterization mission work. Therefore, the 2004 CMRR-NF would not be constructed. Chapter 2, Section 2.6.1, provides a description of the No Action Alternative.

Because the 2004 CMRR-NF would not be constructed, the potential impacts of constructing and operating the 2004 CMRR-NF have not been fully re-evaluated in this *CMRR-NF SEIS*. Instead, with the exceptions discussed below, the potential impacts as presented in the 2003 *CMRR EIS* for the alternative selected in the 2004 ROD are presented for comparison to the impacts of the action alternatives. Many of the analyses in the 2003 *CMRR EIS* did not distinguish between the potential impacts of the CMRR-NF and RLUOB; therefore, the impacts of constructing and operating both buildings are included in this section.

[1] *Each structure, system, and component in a DOE facility is assigned to one of five performance categories depending upon its safety importance. Performance Category 3 (PC-3) structures, systems, and components are those for which failure to perform their safety function could pose a potential hazard to public health, safety, and the environment from release of radioactive or toxic materials. Design considerations for this category are to limit facility damage as a result of design-basis natural phenomena events (for example, an earthquake) so that hazardous materials can be controlled and confined, occupants are protected, and the functioning of the facility is not interrupted.*

Analyses have been updated in three areas. A comprehensive update to the LANL seismic hazards analysis was completed in June 2007 (LANL 2007a), after completion of the 2003 *CMRR EIS*. The updated report used more-recent field study data, most notably from the proposed CMRR-NF site, to update the seismic characterization of LANL, including the probabilistic seismic hazard and horizontal and vertical ground accelerations that would constitute what is considered a design-basis earthquake for the proposed CMRR-NF site. Based on the updated probabilistic seismic hazards analysis, it was concluded that a design-basis earthquake with a return interval of about 2,500 years would have an estimated horizontal peak ground acceleration of 0.52 *g*. The previous estimated horizontal peak ground acceleration for an earthquake with a return interval of about 2,500 years was about 0.3 *g*. As a result of this updated understanding of the seismic hazard, it was concluded that the 2004 CMRR-NF design, as originally conceived, would not survive the updated design-basis earthquake. Therefore, the accident analysis of the 2004 CMRR-NF was updated in this *CMRR-NF SEIS* to reflect the potential consequences and risks associated with such an earthquake. Additionally, analyses of greenhouse gas emissions and the potential impacts of construction transportation on traffic, both of which were not included in the 2003 *CMRR EIS*, have been added to the No Action Alternative analysis.

4.2.2 Land Use and Visual Resources

4.2.2.1 Land Use

Construction and Operations Impacts—Under the No Action Alternative, a total of 26.75 acres (10.8 hectares) would be disturbed during construction of the CMRR Facility (that is, the CMRR-NF and RLUOB) at TA-55. A total of 13.75 acres (5.6 hectares), consisting of land used for buildings (2004 CMRR-NF and RLUOB) and parking lots, would be permanently disturbed. The remaining 13 acres (5.26 hectares) would consist of a construction laydown area (2 acres [0.8 hectares]), an area for a concrete batch plant (5 acres [2 hectares]), and land affected by a road realignment (6 acres [2.4 hectares]). Potential development sites at TA-55 include some areas that have already been disturbed, as well as others that are currently covered with native vegetation, including some mature trees that would have to be cleared prior to construction. Construction and operation of the CMRR Facility at TA-55 would be consistent with the designation of the area for Research and Development and Nuclear Materials Research and Development.

4.2.2.2 Visual Resources

Construction and Operations Impacts—Impacts on visual resources resulting from the construction of the 2004 CMRR-NF at TA-55 under the No Action Alternative would be temporary in nature and could include increased levels of dust and human activity. Once completed, the 2004 CMRR-NF would be one story above ground, and its general appearance would be consistent with current development at LANL. The facility would be readily visible from Pajarito Road and from the upper reaches of the Pajarito Plateau rim. Although the 2004 CMRR-NF would add to the overall development at TA-55, it would not alter the industrial nature of the area. Thus, the current Visual Resource Contrast Class IV rating for TA-55 would not change.

4.2.3 Site Infrastructure

Construction Impacts—Projected annual demands on key site infrastructure resources associated with construction under the No Action Alternative are presented in **Table 4–1**. Existing LANL infrastructure would easily be capable of supporting the construction requirements for the CMRR Facility proposed under this alternative without exceeding site capacities. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource. Construction impacts on the local transportation network would be minimal.

Table 4–1 No Action Alternative — Annual Site Infrastructure Requirements for 2004 CMRR-NF and RLUOB Construction

Resource	*Available Site Capacity* [a]	*Total Requirement* [b]	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	601,000	63	0.01
Peak load demand (megawatts)	26	0.3	1.2
Fuel			
Natural gas (million cubic feet per year)	5,860	0	0
Water (million gallons per year)	130	0.75	0.6

CMRR-NF= Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Capacity minus the current site requirements, a calculation based on the data provided in Chapter 3, Table 3–3, of this SEIS.

[b] Total estimated infrastructure requirements for the CMRR-NF and RLUOB are presented annually, assuming a 5-year construction period for both facilities.

Source: Table 3–3; DOE 2003b.

Operations Impacts—Resources needed annually to support operations under the No Action Alternative are presented in **Table 4–2**. All of the requirements associated with CMRR Facility operations would be well within the available site capacity.

Table 4–2 No Action Alternative — Annual Site Infrastructure Requirements for 2004 CMRR-NF and RLUOB Operations

Resource	*Available Site Capacity* [a]	*Total Requirement*	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	601,000	19,300	3.2
Peak load demand (megawatts)	26	2.6	10
Fuel			
Natural gas (million cubic feet per year)	5,860	Not available	Not available
Water (million gallons per year)	130	10.4	8.0

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Capacity minus the current site requirements, a calculation based on the data provided in Chapter 3, Table 3–3, of this SEIS.

Source: Table 3–3; DOE 2003b.

4.2.4 Air Quality and Noise

NNSA determined that the Clean Air Act "General Conformity Rule" would not apply, and no conformity analysis would be required because LANL is located in an attainment area for all criteria pollutants and ambient air quality standards would not be exceeded (DOE 2003b).

4.2.4.1 Air Quality

Construction Impacts—Construction of a CMRR Facility (2004 CMRR-NF and RLUOB) at TA-55 would result in temporary emissions from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations were modeled for the construction of the CMRR Facility at TA-55 and compared to the most stringent standards (see **Table 4–3** and Chapter 3, Section 3.4.2). The maximum ground-level concentrations off site or along the perimeter road to which the public has regular access would be below the ambient air quality standards. Concentrations along Pajarito Road adjacent to the construction site would be higher and could exceed the 24-hour ambient standards for nitrogen dioxide, particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), and total suspended particulates. However, the public would not be allowed access to this section of road. Actual criteria pollutant concentrations are expected to be less because conservative emission factors and other assumptions, which tend to overestimate the impacts, were used in the modeling of construction activities. The maximum short-term concentrations during construction would occur at the eastern site boundary at points accessible to the public on a regular basis. The maximum annual criteria pollutant concentrations would occur at a receptor located to the north at the Royal Crest Trailer Park.

Table 4–3 No Action Alternative — Nonradiological Air Quality Concentrations at Technical Area 55 Site Boundary – Construction

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)* [a]	*Calculated Concentration (parts per million)* [b]
Carbon monoxide	1 hour	13	0.20
	8 hours	8.7	0.026
Nitrogen dioxide	Annual	0.05	0.00059
Sulfur dioxide	3 hours	0.5 [c]	0.0089
	24 hours	0.1	0.0011
	Annual	0.02	3.9×10^{-5}
PM_{10}	24 hours	150 μg/m³	34 μg/m³
Total suspended particulates	24 hours	150 μg/m³	67 μg/m³
	Annual	60 μg/m³	4.0 μg/m³

μg/m³ = micrograms per cubic meter; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAAQS are more stringent than the Federal standards; thus, emissions are compared to the latest NMAAQS consistent with other air quality analyses in this SEIS. All emissions were converted from micrograms per cubic meter, as shown in Table 4–9 of the *CMRR EIS*, to parts per million using the appropriate corrections for temperature (70 degrees Fahrenheit) and a site elevation of 7,229 feet, in accordance with New Mexico dispersion modeling guidelines (NMAQB 2010).

[b] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[c] NMAAQS does not have a 3-hour standard; thus, the current Federal standard (from the National Ambient Air Quality Standards [NAAQS]) is used here.

Source: DOE 2003a.

Radiological releases from construction activities are not expected. As described in Section 2.5, the RLUOB has been constructed and the CMRR-NF site has been excavated down to about 30 feet (9.1 meters) already and no contamination was encountered. Any suspected or known contaminated areas from prior LANL activities would be evaluated to identify procedures for working within those areas and to determine the need to remove site contamination. Contaminated soils would be removed as necessary to protect worker health or the environment before construction was initiated. Any contaminated soil removed would characterized and disposed of appropriately at LANL or an offsite waste management facility.

Operations Impacts—Under the No Action Alternative, criteria and toxic air pollutants would be generated from operation and testing of an emergency generator at TA-55. **Table 4–4** summarizes the concentrations of criteria pollutants from CMRR Facility operations at TA-55. The concentrations are compared to their corresponding ambient air quality standards (see Chapter 3, Section 3.4.2). The maximum ground-level concentrations that would result from CMRR Facility operations at TA-55 would be below the ambient air quality standards. Actual criteria pollutant concentrations are expected to be less because conservative stack parameters were assumed in the modeling of the diesel emergency generator. The maximum annual criteria pollutant concentrations would occur at the Royal Crest Trailer Park. The maximum short-term concentrations would also occur at the Royal Crest Trailer Park north of TA-55 at the LANL site boundary. No major changes in emissions or air pollutant concentrations at LANL would be expected under this alternative.

Approximately 0.00076 curies per year of actinides and 2,645 curies of fission products and hydrogen-3 (tritium) would be released to the environment from relocated CMR Building operations at TA-55 (DOE 2003b). Impacts of radiological air pollutants are discussed in Section 4.2.10.

Table 4–4 No Action Alternative — Nonradiological Air Quality Concentrations at Technical Area 55 Site Boundary – Operations

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)* [a]	*Calculated Concentration (parts per million)* [b]
Carbon monoxide	1 hour	13	0.027
	8 hours	8.7	0.060
Nitrogen dioxide	Annual	0.05	1.2×10^{-5}
Sulfur dioxide	3 hours	0.5 [c]	0.10
	24 hours	0.1	0.014
	Annual	0.02	5.5×10^{-6}
PM_{10}	24 hours	150 µg/m³	1.4 µg/m³
Total suspended particulates	24 hours	150 µg/m³	2.4 µg/m³
	Annual	60 µg/m³	0.001 µg/m³

µg/m³ = micrograms per cubic meter; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAAQS are more stringent than the Federal standards; thus, emissions are compared to the latest NMAAQS consistent with other air quality analyses in this SEIS. All emissions were converted from micrograms per cubic meter, as shown in Table 4–10 of the *CMRR EIS*, to parts per million using the appropriate corrections for temperature (70 degrees Fahrenheit) and a site elevation of 7,229 feet, in accordance with New Mexico dispersion modeling guidelines (NMAQB 2010).

[b] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[c] NMAAQS does not have a 3-hour standard; thus, the Federal standard (from the NAAQS) is used here.

Source: DOE 2003a.

4.2.4.2 Greenhouse Gas Emissions

Greenhouse gas emissions were not analyzed in the 2003 *CMRR EIS*. The impacts on greenhouse gas emissions due to construction and operation of the 2004 CMRR-NF under the No Action Alternative are discussed below.

Construction Impacts—Under the No Action Alternative, construction of the 2004 CMRR-NF at TA-55 would result in temporary greenhouse gas emissions from construction equipment, material transport trucks, personnel commutes, and electricity consumption.

Emissions of greenhouse gases from these construction activities, excluding electricity consumption, were estimated to be more than 4,000 tons carbon-dioxide equivalent per year (3,700 metric tons per year) (see **Table 4–5**). Compared to the 2008 site-wide greenhouse gas baseline emissions, 440,000 tons

(400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011)[2], there would be a minimal and temporary increase (about 1 percent) in greenhouse gases from the construction of the 2004 CMRR-NF under the No Action Alternative.

Table 4–5 No Action Alternative — 2004 CMRR-NF Construction Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*			
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*Total CO_2e*
Scope 3 [a]	Sitework/grading	1,300	1	10	1,310
	Construction	1,900	3	40	1,940
	Materials transport	100	0	0	100
	Personnel Commutes	850	1	20	871
	Subtotal	4,150	5	70	4,220
Scope 2 [b]	Electricity Use	66	0	0	66
	Total	4,220	5	71	4,290

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent.

[a] Scope 3 sources include indirect emissions of construction equipment not owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

[c] The electrical requirement estimated in the 2003 *CMRR EIS* was based on preconceptual design information and is now known to be greatly underestimated.

Note: Totals may not equal the sum of the contributions due to rounding.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the Council on Environmental Quality (CEQ) suggested that proposed actions that are reasonably anticipated to cause direct emissions of 25,000 metric tons or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but a minimum level that would require consideration in National Environmental Policy Act (NEPA) documentation (see Chapter 3, Section 3.4.4, and Chapter 5, Section 5.4). There would be no direct or Scope 1 greenhouse gas emissions during construction under the No Action Alternative.

Operations Impacts—Operations of the 2004 CMRR-NF and RLUOB would release greenhouse gases into the atmosphere annually as a result of emissions associated with personnel commutes, refrigerants used to cool the building, a backup diesel generator, and electricity consumption (see **Table 4–6**). Since no new hires would be needed, emissions from personnel commutes are already included in the baseline inventory and are not included here. Total greenhouse gases emitted during normal operations of the 2004 CMRR-NF and RLUOB under the No Action Alternative, excluding the offsite emissions from electricity consumption, would be approximately 1,100 tons (1,000 metric tons) of carbon-dioxide equivalent per year. Compared to site-wide greenhouse gas emissions, 440,000 tons (400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011), there would be a minimal increase in greenhouse gases from normal operations of the 2004 CMRR-NF and RLUOB under the No Action Alternative.

[2] *The projected LANL site-wide greenhouse gas emissions associated with the electrical usage corresponding to the operations selected in the 2008* Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico *(LANL SWEIS) RODs would be 543,000 tons per year.*

Emissions from the generation of purchased electricity occur at offsite power plants that are not owned or controlled by LANL. Emissions from electricity use during the operation of the 2004 CMRR-NF are approximately 12,700 tons per year (11,500 metric tons per year); however, the electrical requirement estimated in the 2003 *CMRR EIS* was based on preconceptual design information and is now known to be greatly underestimated. The total greenhouse gas emissions from the operation of the 2004 CMRR-NF and RLUOB, including electricity use, would be approximately 13,800 tons (12,900 metric tons) per year.

Table 4–6 No Action Alternative — 2004 CMRR-NF and RLUOB Operations Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*				
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*HFC CO_2e*	*Total CO_2e*
Scope 1 [a]	Refrigerants Used	N/A	N/A	N/A	1,100	1,100
	Backup Generator	2	0	0	N/A	1.6
	Subtotal	2	0	0	1,100	1,100
Scope 2 [b]	Electricity Use [c]	12,600	5	55	N/A	12,700
	Total	12,600	5	55	1,100	13,800

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent; HFC CO_2e = hydrofluorocarbons in carbon-dioxide equivalent; N/A = not applicable; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Scope 1 sources include emissions of direct stationary sources owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not owned or controlled by LANL.

[c] The electrical requirement estimated in the 2003 *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* was based on preconceptual design information and is now known to be greatly underestimated.

Note: Totals may not equal the sum of the contributions due to rounding.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 25,000 metric tons or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but a minimum level that would require consideration in NEPA documentation. The direct (Scope 1) greenhouse gas emissions during operations of the 2004 CMRR-NF under the No Action Alternative are from the backup generator and refrigerants used for cooling. Together, the Scope 1 emissions during operation of the 2004 CMRR-NF and RLUOB under the No Action Alternative (1,100 tons or 1,000 metric tons of carbon-dioxide equivalent per year) would be below the CEQ suggested level of 25,000 metric tons per year.

4.2.4.3 Noise

Construction Impacts—Construction of the 2004 CMRR-NF at TA-55 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance to wildlife near the area could occur as a result of the operation of construction equipment. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from construction employees' vehicles and materials shipment. Noise sources associated with construction at TA-55 are not expected to include loud, impulsive sources such as from blasting.

Operations Impacts—Noise impacts resulting from CMRR Facility operations at TA-55 would be similar to those resulting from existing operations at TA-55. Although there would be a small increase in traffic and equipment noise (such as heating and cooling systems) near the area, there would be little change in noise impacts on wildlife and no change in noise impacts on the public outside of LANL as a result of moving CMR Building activities to TA-55.

4.2.5 Geology and Soils

Construction Impacts—Construction of the CMRR Facility under this alternative would require aggregate and other geologic resources to support construction activities at TA-55, but these resources are abundant within a 500-mile (800-kilometer) radius. Relatively deep subsurface excavation would be required to construct belowground portions of the CMRR Facility.

A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes.

Operations Impacts— CMRR Facility operations under this alternative would not impact geologic or soil resources at LANL. Seismic accident analysis is discussed in Section 4.2.10.2.

4.2.6 Surface-Water and Groundwater Quality

4.2.6.1 Surface Water

Construction Impacts—There are no natural surface-water drainages in the vicinity of the proposed 2004 CMRR-NF site in TA-55 or Mesita del Buey, and no surface water would be used to support facility construction. It is expected that portable toilets would be used for construction personnel, resulting in no onsite direct discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 4.2.12.

Stormwater runoff from construction areas could potentially impact downstream surface-water quality. Appropriate soil erosion and sediment control measures (such as sediment fences and mulching disturbed areas) and spill prevention practices would be employed during construction to minimize suspended sediment and material transport and potential water quality impacts. TA-55 is not in an area that is prone to flooding, and the nearest 100-year floodplains are located at a distance of approximately 650 feet (200 meters) in Twomile Canyon, 1,900 feet (580 meters) in Mortandad Canyon, and 3,000 feet (910 meters) in Pajarito Canyon.

Operations Impacts—No impacts on surface-water quality are expected as a result of CMR operations at TA-55 under this alternative. No surface water would be used to support facility activities, and there would be no direct discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated by facility staff use of lavatory, shower, and break room facilities and from miscellaneous potable and sanitary uses. As planned, this wastewater would be collected by an expanded TA-55 sanitary sewer system and conveyed to appropriate wastewater treatment facilities for ultimate disposal. Radioactive liquid waste would be transported via a radioactive liquid waste pipeline to the existing Radioactive Liquid Waste Treatment Facility (RLWTF). The design and operation of new buildings would incorporate appropriate stormwater management controls to safely collect and convey stormwater from facilities while minimizing washout and soil erosion. Overall, operational impacts on site surface waters and downstream water quality would be expected to be minimal.

4.2.6.2 Groundwater

Construction Impacts—Groundwater would be required to support construction activities at TA-55. The volume of groundwater required for construction would be small compared to site availability and historic usage, and there would be no onsite discharge of wastewater to the surface or subsurface. No impact on groundwater availability or quality is anticipated from construction activities in TA-55.

Operations Impacts—Relocated CMR operations and activities at TA-55 under the No Action Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel, as well as for miscellaneous building mechanical uses. It is estimated that new building operations under this alternative would require about 10.4 million gallons (39.4 million liters) per year of groundwater. This demand is a small fraction of total LANL usage and would not exceed site availability. Therefore, no additional impact on regional groundwater availability is anticipated.

Waste generation and management activities are detailed in Section 4.2.12. No sanitary or industrial effluent would be discharged directly to the surface or subsurface. Thus, no operational impacts on groundwater quality are expected.

4.2.7 Ecological Resources

4.2.7.1 Terrestrial Resources

Construction Impacts—Although TA-55 is located within the ponderosa pine forest vegetation zone, few trees exist in developed portions of the area. Where construction would occur on previously disturbed land, there would be little or no impact on terrestrial resources. However, construction would remove some previously undisturbed ponderosa pine forest, resulting in the loss of less-mobile wildlife, such as reptiles and small mammals, and causing more-mobile species, such as birds or large mammals, to be displaced. The success of displaced animals would depend on the carrying capacity[3] of the area into which they move. If the area were at or near its carrying capacity, displaced animals would not likely survive. (Since the issuance of the 2004 ROD associated with the *CMRR EIS*, activities at the proposed TA-55 site related to RLUOB construction and geological studies have resulted in the elimination of this forestland.) Indirect impacts of construction, such as noise or human disturbance, could also impact wildlife living adjacent to the construction zone. Although temporary, such disturbance would span the construction period and the time required for the habitat to naturally regenerate. The work area would be clearly marked to prevent construction equipment and workers from disturbing adjacent natural habitat.

Operations Impacts—CMRR Facility operations would have a minimal impact on terrestrial resources within or adjacent to TA-55. As wildlife residing in the area has already adjusted to current levels of noise and human activity associated with current TA-55 operations, it is unlikely to be adversely affected by similar activities associated with CMRR Facility operations. Areas not permanently disturbed by the new CMRR Facility (for example, construction laydown areas) would be landscaped. While these areas would provide some habitat for wildlife, it is likely that species composition and density would differ from preconstruction conditions.

4.2.7.2 Wetlands

Construction and Operations Impacts—Although there are three areas of wetlands located within TA-55, none is present in the proposed 2004 CMRR-NF construction area. Thus, there would be no direct impacts on wetlands. Further, indirect impacts on these wetlands due to erosion should not occur because water from the site drains into the Pajarito watershed and not the Mortandad watershed, in which these wetlands are located. In addition, a sediment and erosion control plan would be implemented to control stormwater

[3] *Carrying capacity in the ecological context is defined as the threshold of stress below which populations and ecosystem functions can be sustained.*

runoff during construction and operation, thus preventing impacts on wetlands located further down Pajarito Canyon.

4.2.7.3 Aquatic Resources

Construction and Operations Impacts—The only aquatic resources present at TA-55 are small pools associated with wetlands. There would be no impact on these resources from the construction of the 2004 CMRR-NF or operation of the CMRR Facility.

4.2.7.4 Threatened and Endangered Species

Construction Impacts—Areas of environmental interest have been established for the Mexican spotted owl and southwestern willow flycatcher. (Since the issuance of the 2004 ROD associated with the *CMRR EIS*, the bald eagle has been federally delisted due to recovery.) Portions of TA-55 include both core and buffer zones for the Mexican spotted owl, federally classified as a threatened species; however, annual surveys have not identified the spotted owl within these zones. Construction of the 2004 CMRR-NF is not expected to directly affect individuals of this species, but could remove a small portion of the Mexican spotted owl's habitat buffer area; this potential effect on Mexican spotted owl habitat would not likely be adverse. In 2003, the U.S. Fish and Wildlife Service concurred with NNSA's determination that the construction and operation of the CMRR Facility at TA-55 would not be likely to adversely affect either individuals of threatened or endangered species currently listed or their critical habitat at LANL. Core and buffer zones for the southwestern willow flycatcher do not overlap TA-55. No impacts that violate the provisions of the Bald and Golden Eagle Protection Act or the Migratory Bird Treaty Act have been identified.

Operations Impacts—CMRR Facility operations at TA-55 would not directly affect any endangered, threatened, or special status species. Noise levels associated with the CMRR Facility would be low, and human disturbance would be similar to that already occurring within TA-55; however, parking activities at the CMRR Facility could be in close proximity to the Mexican spotted owl's potential habitat area and may indirectly affect that potential habitat. In addition, nighttime lighting at the parking lot could indirectly affect prey species activities; therefore it would not be directed toward canyon areas to reduce such impacts. These are not likely to be adverse effects on the Mexican spotted owl's potential habitat areas.

4.2.8 Cultural and Paleontological Resources

Construction and Operations Impacts—Adverse impacts on historic resources at TA-55 resulting from construction and operation of the CMRR Facility are not expected. There are no prehistoric sites located within TA-55. There is one prehistoric site located near the boundary of TA-55 within TA-48 that is eligible for listing in the National Register of Historic Places (NRHP). This site would be avoided during construction of the 2004 CMRR-NF and operation of the CMRR Facility. Some of the 10 historic sites located within TA-55 could be disturbed by the construction of the 2004 CMRR-NF. As appropriate, NNSA would consult with the State Historic Preservation Officer and, if necessary, data and artifact recovery would be conducted. There are no known paleontological resources present at TA-55 at LANL.

The area at TA-55 proposed to house the 2004 CMRR-NF has not been surveyed for traditional cultural properties. If any traditional cultural properties are found during construction, work would stop while appropriate actions are undertaken. Thus, it is expected that there would be no impacts on these resources.

4.2.9 Socioeconomics

Construction Impacts—Construction of new buildings at TA-55 to house CMR activities would require a peak construction employment level of 300 workers. This level of employment would generate about 852 indirect jobs in the region around LANL. The potential total employment increase of 1,152 direct and indirect jobs represents an approximate 1.3 percent increase in the workforce and would occur over the proposed construction period. This small increase would have little or no noticeable impact on the socioeconomic conditions of the region of influence (ROI).

Operations Impacts—CMRR Facility operations would require a workforce of approximately 550 workers. As evaluated in the *CMRR EIS*, this would be an increase of about 340 workers over currently restricted CMR Building operational requirements. Nevertheless, the increase in the number of workers in support of expanded CMRR Facility operations would have little or no noticeable impact on socioeconomic conditions in the LANL ROI. New LANL employees hired to support the CMRR Facility would compose a small fraction of the LANL workforce and an even smaller fraction of the regional workforce.

4.2.10 Human Health

4.2.10.1 Normal Operations

Radiological Impacts

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers would be at a small risk for construction-related accidents and radiological exposures. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses are kept as low as is reasonably achievable.

Operations Impacts—Normal operations of the CMRR Facility at TA-55, as evaluated in the 2003 *CMRR EIS*, are not expected to result in an increase in latent cancer fatalities (LCFs) in the general public. Under this alternative, the radiological releases to the atmosphere from the 2004 CMRR-NF and RLUOB at TA-55 would be those shown in **Table 4–7**. The actinide emissions listed in this table are in the form of plutonium, uranium, thorium, and americium isotopes. In estimating the human health impacts, all emissions were considered to be plutonium-239. This is conservative because the human health impacts on a per-curie basis are greater for plutonium-239 than for the other actinides associated with CMR activities.

Doses from radiological emissions under the No Action Alternative are presented as they were reported in the 2003 *CMRR EIS*. They were based on internal dose conversion factors from Federal Guidance Report No. 11 (EPA 1988). For the same exposure, doses would be slightly lower using the more recent Federal Guidance Report No. 13 (EPA 1993b) factors. **Table 4–8** shows the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the CMRR Facility at TA-55 was estimated to be 1.9 person-rem under the No Action Alternative. This population dose increases the annual risk of a single latent fatal cancer in the population by 0.0011. Another way of stating this is that the likelihood that one fatal cancer would occur in the population as a result of radiological releases associated with this alternative is about 1 chance in 1,000 per year. Statistically, LCFs are not expected to occur in the population as a result of CMRR Facility operations at TA-55.

Table 4–7 No Action Alternative — 2004 CMRR-NF and RLUOB Radiological Emissions During Normal Operations

Nuclide	*Emissions (curies per year)*
Actinides	0.00076
Krypton-85	100
Xenon-131m	45
Xenon-133	1,500
Hydrogen-3 (tritium) [a]	1,000

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] The tritium release is in the form of both tritium oxide (750 curies) and elemental tritium (250 curies). Tritium oxide is more readily absorbed by the body; therefore, the health impact of tritium oxide on a receptor is greater than that for elemental tritium. For this reason, all of the tritium release has been conservatively modeled as if it were tritium oxide.

Source: DOE 2003b.

Table 4–8 No Action Alternative — Annual Radiological Impacts of CMRR-NF and RLUOB Operations on the Public

	Population Within 50 Miles [a] (80 kilometers)	*Average Individual Within 50 Miles (80 kilometers)*	*Maximally Exposed Individual*
Dose	1.9 person-rem	0.0063 millirem	0.33 millirem
Cancer fatality risk [b]	0.0011	4×10^{-9}	2×10^{-7}
Regulatory dose limit [c]	Not applicable	10 millirem	10 millirem
Dose as a percentage of the regulatory limit	Not applicable	0.06	3.3
Dose from background radiation [d]	139,000 person-rem	450 millirem	450 millirem
Dose as a percentage of background dose	0.0014	0.0014	0.07

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] The population dose for this table was based on the 2000 population estimate of about 309,000 surrounding TA-55, as shown in Table 4–12 of the *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico*.

[b] Based on a risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

[c] 40 *Code of Federal Regulations* Part 61, Subpart H, establishes an annual limit of 10 millirem via the air pathway to any member of the public from DOE operations. There is no standard for a population dose.

[d] The annual individual dose from background radiation at LANL is 480 millirem (see source of ubiquitous background radiation in Chapter 3, Section 3.11.1).

Source: DOE 2003b.

The average annual dose to an individual in the population would be 0.0063 millirem. The corresponding increased risk of an individual developing a fatal cancer from receiving the average dose would be 4×10^{-9}, or about 1 chance in 250 million per year. The maximally exposed individual (MEI) member of the public would receive an estimated annual dose of 0.33 millirem. This dose corresponds to an increased annual risk of developing a fatal cancer of 2×10^{-7}. In other words, the likelihood that the MEI would develop a fatal cancer is about 1 chance in 5 million for each year of operation.

Estimated annual doses to workers involved with CMRR Facility operations (involved workers) under the No Action Alternative are provided in **Table 4–9**. The estimated worker doses are based on historical exposure data for LANL workers (DOE 2003b). Based on the reported data, the average annual dose to a LANL worker who received a measurable dose was 104 millirem. A value of 110 millirem has been used as the estimate of the average annual worker dose per year of operations at the 2004 CMRR-NF and RLUOB at TA-55.

Table 4–9 No Action Alternative —Annual Radiological Impacts of 2004 CMRR-NF and RLUOB Operations on Workers

	Individual Worker	*Worker Population* [a]
Dose	110 millirem	61 person-rem
Fatal cancer risk [b]	0.000066	0.04
Dose limit [c]	5,000 millirem	Not available
Administrative control level [d]	500 millirem	Not available

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Based on a worker population of 550 for the 2004 CMRR-NF at Technical Area 55. Dose limits and administrative control levels do not exist for worker populations.

[b] Based on a worker risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

[c] 10 CFR 835.202.

[d] DOE 1999b (DOE Standard 1098-99).

Source: DOE 2003b.

This 110-millirem dose is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 *Code of Federal Regulations* [CFR] Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). This average annual dose corresponds to an increased risk of a fatal cancer of 0.000066 for each year of operations. In other words, the likelihood that a worker would develop a fatal cancer from annual work-related exposure is about 1 chance in 14,000.

Based on a worker population of 550, the estimated annual worker population dose would be 61 person-rem. This would increase the likelihood of a fatal cancer within the worker population by 0.04 per year. In other words, on an annual basis, there is less than 1 chance in 25 of one fatal cancer developing in the entire worker population (550 workers) as a result of exposures associated with activities under this alternative.

Hazardous Chemical Impacts

No chemical-related health impacts on the public would be associated with this alternative. The laboratory quantities of chemicals that could be released to the atmosphere during normal operations are minor quantities and would be below the screening levels used to determine the need for additional analysis. Workers would be protected from adverse effects from the use of hazardous chemicals by adherence to Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (EPA) occupational standards that limit concentrations of potentially hazardous chemicals.

4.2.10.2 Facility Accidents

Radiological Impacts

Radiological impacts of facility accidents at the 2004 CMRR-NF were evaluated in the *CMRR EIS*. Appendix C of the *CMRR EIS* provides the methodology and assumptions used to develop facility accident scenarios and estimate doses to the general public within 50 miles (80 kilometers), to an MEI, and to an onsite worker near the facility. The doses included in the *CMRR EIS* were calculated using MACCS2 [MELCOR Accident Consequence Code Systems], Version 1.12. The accident scenarios in the *CMRR EIS* were reviewed and compared with accidents from more-recent safety analyses for the CMR Building and preliminary analyses for the 2004 CMRR-NF (LANS 2011a, 2011b). Based on this review, four accidents are included in this *CMRR-NF SEIS*, representing a wide range of possible accidents and risks (see Appendix C). The four accident scenarios are common to all three alternatives analyzed in this *CMRR-NF SEIS*. They are a facility-wide fire, a seismically induced spill, a seismically induced fire, and a loading dock spill/fire.

In this SEIS, doses were estimated using MACCS2, Version 1.13.1. Using the scenarios discussed above, the only other changes in parameters used from those presented in Appendix C of the *CMRR EIS* are a new 2030 projected population distribution within 50 miles (80 kilometers) of the 2004 CMRR-NF (projected to be about 545,000 persons surrounding TA-55) and a revised distance to the nearest offsite individual (0.75 miles [1.2 kilometers]) from the 2004 CMRR-NF. All other assumptions are consistent with those presented in Appendix C of the *CMRR EIS*. Because of these changes, the calculated consequences and risks presented in this SEIS are different from those estimated in the 2003 *CMRR EIS*.

As indicated in Appendix C of this *CMRR-NF SEIS*, two sets of accident source terms are presented. First, the conservative source terms developed in the safety-basis process at LANL are presented. In general, these conservative source term estimates take little or no credit for the integrity of containers or building confinement under severe accidents and assume a damage ratio of 1, meaning that all material at risk would be subjected to the similar, near worst-case conditions. Furthermore, these safety evaluations assume that all of the material at risk that is made airborne and respirable is released to the environment (leak path factor of 1).

For purposes of this *CMRR-NF SEIS*, a second set of source terms was developed that presents reasonable, but still conservative, estimates of source terms. These source terms take into account a range of responses of facility features and materials containers and typical operating practices at plutonium facilities at LANL and elsewhere. Therefore, for design-basis-type accidents, a damage ratio of 1 normally would not be realistic if the containers, process enclosures, limits on combustibles, and similar types of safety systems functioned during the accident. Similarly, the building confinement, including high-efficiency particulate air (HEPA) filters, would be expected to remain functioning, although at perhaps a degraded level, during and after the accident.

Tables 4–10 and **4–11** provide the revised accident consequences and risks, respectively. These tables provide accident consequences and risks to the offsite MEI, a member of the public at the nearest public location (0.75 miles [1.2 kilometers] north-northeast from TA-55); the offsite population living within 50 miles (80 kilometers) of the CMRR-NF at TA-55; and a noninvolved worker assumed to be at the TA-55 boundary, about 240 yards (220 meters) from the CMRR-NF.

Table 4–10 presents the frequencies and consequences of the postulated set of accidents for these three receptors, and Table 4–11 presents the accident risks obtained by multiplying each accident's consequences by the likelihood (frequency per year) that the accident would occur.

As shown in Table 4–11, the accident with the highest potential risk would be a seismically induced spill (safety-basis scenario) that would severely damage the 2004 CMRR-NF. The annual risk of an LCF for the MEI would be 7×10^{-3}. In other words, the MEI's likelihood of developing a fatal cancer from this event would be about 1 chance in 143 per year. The dose to the offsite population would increase the risk of fatal cancers in the entire population. The risk of developing one fatal cancer in the entire population from this event would be 8×10^{-1} per year. LCFs are expected to occur in the population if this accident occurs in the 2004 CMRR-NF. The risk of an LCF to a noninvolved worker would be 1×10^{-2}, or about 1 chance in 100 per year.

Table 4–10 No Action Alternative — Accident Frequency and Consequences

Accident	Frequency (per year)	Maximally Exposed Individual		Offsite Population [a]		Noninvolved Worker at TA Boundary	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Safety-Basis Scenarios							
Facility-wide fire	0.0001	1.1	0.0007	710	0 (0.4)	5.9	0.004
Seismically induced spill	0.01	600	0.7	140,000	80	20,000	1
Seismically induced fire	0.0001	5,000	1	3,800,000	2,000	27,000	1
Loading dock spill/fire	0.01	0.028	0.00002	6.4	0 (0.004)	1.0	0.0006
SEIS Scenarios							
Facility-wide fire	0.000001	0.011	0.000007	7.2	0 (0.004)	0.059	0.00004
Seismically induced spill	0.001	6.0	0.004	1,400	1 (0.8)	200	0.2
Seismically induced fire	0.0001	2.4	0.001	1,800	1	13	0.008
Loading dock spill/fire	0.0001	0.028	0.00002	6.4	0 (0.004)	1.0	0.0006

SEIS = supplemental environmental impact statement, TA = technical area.
[a] Based on a projected 2030 population estimate of 545,000 persons residing within 50 miles (80 kilometers) of TA-55.
[b] Increased likelihood of an LCF for an individual if the accident occurs.
[c] Increased number of LCFs in the offsite population if the accident occurs (results rounded to one significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.

Table 4–11 No Action Alternative — Annual Accident Risks

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Individual [a]	Offsite Population [b, c]	Noninvolved Worker at TA Boundary [a]
Safety-Basis Scenarios			
Facility-wide fire	7×10^{-8}	4×10^{-5}	4×10^{-7}
Seismically induced spill	7×10^{-3}	8×10^{-1}	1×10^{-2}
Seismically induced fire	1×10^{-4}	2×10^{-1}	1×10^{-4}
Loading dock spill/fire	2×10^{-7}	4×10^{-5}	6×10^{-6}
SEIS Scenarios			
Facility-wide fire	7×10^{-12}	4×10^{-9}	4×10^{-11}
Seismically induced spill	4×10^{-6}	8×10^{-4}	2×10^{-4}
Seismically induced fire	1×10^{-7}	1×10^{-4}	8×10^{-7}
Loading dock spill/fire	2×10^{-9}	4×10^{-7}	6×10^{-8}

SEIS = supplemental environmental impact statement, TA = technical area.
[a] Increased risk of an LCF to the individual.
[b] Increased risk of an LCF in the offsite population.
[c] Based on a projected 2030 population estimate of 545,000 persons residing within 50 miles (80 kilometers) of TA-55.

The risks associated with seismically induced accidents at the 2004 CMRR-NF, if they were to occur, would exceed DOE guidelines (see Appendix C) and would present unacceptable risks to the public and the LANL workforce. This is because the building is predicted to fail in the event of a design-basis earthquake (see Appendix C). The results presented in Tables 4–10 and 4–11 indicate that the 2004 CMRR-NF presents a very high risk to the offsite population. To reduce the doses to the offsite MEI and offsite population from these accidents to acceptable levels, the material at risk in the 2004 CMRR-NF would have to be reduced from 6.6 tons (6.0 metric tons) to about 11 pounds (5 kilograms) or less, severely limiting the usefulness of the building and rendering it unable to fulfill its mission.

Involved Worker Impacts

Approximately 550 workers would be at the 2004 CMRR-NF and RLUOB during operations. Workers near an accident could be at risk of serious injury or death. Following initiation of accident and site emergency alarms, workers in adjacent areas of the facility would evacuate the area in accordance with the technical area and facility emergency operating procedures and training in place.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals used in CMRR Facility operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the 2004 CMRR-NF would be well below the threshold quantities set by the EPA (40 CFR Part 68) and would pose minimal potential hazards to the public health and the environment in an accident condition. These chemicals would be stored and handled in laboratory quantities and would only be a hazard to involved workers under accident conditions.

4.2.10.3 Intentional Destructive Acts

NNSA has prepared a classified appendix to this *CMRR-NF SEIS* that evaluates the potential impacts of malevolent, terrorist, or intentional destructive acts. Substantive details of terrorist attack scenarios, security countermeasures, and potential impacts are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks. NNSA's strategy for mitigation of environmental impacts resulting from extreme events, including intentional destructive acts, has three distinct components: (1) prevention or deterrence of successful attacks; (2) planning and timely and adequate response to emergency situations; and (3) progressive recovery through long-term response in the form of monitoring, remediation, and support for affected communities and the environment.

Depending on the intentional destructive acts, the impacts could be similar to the impacts of the accidents analyzed in this SEIS. However, there may be intentional destructive act scenarios for which the impacts exceed those of the accidents analyzed. Analysis of these intentional destructive act impacts provides NNSA with information upon which to base, in part, decisions regarding the construction and operation of the 2004 CMRR-NF. The classified appendix evaluates the similarity of scenarios involving intentional destructive acts with those evaluated in the *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (LANL SWEIS)* and *Complex Transformation Supplemental Programmatic Environmental Impact Statement* and presents the potential consequences to a noninvolved worker, an MEI, and the population in terms of physical injuries, radiation doses, and LCFs. Although the results of the analyses cannot be disclosed, the following general conclusion can be drawn: the potential consequences of intentional destructive acts are highly dependent on the distance to the site boundary and the size and proximity of the surrounding population; the closer and denser the surrounding population, the higher the consequences. In addition, it is generally easier and more cost-effective to protect new facilities because new security features can be incorporated into their design. In other words, the protective forces needed to defend new facilities may be smaller due to the inherent security features of a new facility. New facilities can, as a result of design features, better prevent security attacks and reduce the impacts of such attacks.

4.2.11 Environmental Justice

Construction Impacts—As discussed throughout the other subsections of Section 4.2, environmental impacts due to construction would be temporary and would not extend beyond the boundary of LANL. For these reasons, under the No Action Alternative, construction at TA-55 would not result in disproportionately high and adverse environmental impacts on the public living within the potentially affected area surrounding TA-55, including low-income and minority populations.

Operations Impacts—Radiological and hazardous chemical risks to the public resulting from normal operations would be small. Table 4–8 shows the health risks associated with these releases also would be small. Normal operations at the CMRR Facility at TA-55 are not expected to cause fatalities or illness among the general population surrounding TA-55, including minority and low-income populations living within the potentially affected area.

Residents of the Pueblo of San Ildefonso have expressed concern that pollution from CMRR Facility operations could contaminate Mortandad Canyon, which drains onto pueblo land and sacred areas. CMRR Facility operations under this alternative are not expected to adversely affect air quality. There would be no direct liquid discharges and stormwater management controls would be in place to collect stormwater and prevent washout and soil erosion. Thus, there would be no contamination of tribal lands adjacent to the LANL boundary (DOE 2003b). In summary, implementation of the No Action Alternative would not pose disproportionately high and adverse environmental risks to low-income or minority populations living in the potentially affected area around the CMRR Facility at TA-55.

4.2.12 Waste Management and Pollution Prevention

Construction Impacts—Only nonhazardous waste would be generated from construction activities to relocate CMR Building operations and materials to the 2004 CMRR-NF at TA-55. No radioactive or hazardous waste would be generated during construction activities.

Solid, nonhazardous waste generated from construction activities associated with the 2004 CMRR-NF at TA-55 would be processed at the Los Alamos County Eco Station, where it would be separated into materials suitable for recycle or disposal, then disposed of at an offsite solid waste facility permitted to accept the waste. Approximately 578 tons (524 metric tons) of solid, nonhazardous waste, consisting primarily of gypsum board, wood scraps, nonrecyclable scrap metals, concrete, steel, and other construction waste, would be generated from the construction activities. Over the construction period, this would represent about 20 percent of the annual solid nonhazardous waste generated at LANL. Management of this additional waste at LANL would be within the capabilities of the LANL waste management program, but additional waste management personnel may be required.

Construction debris would be collected in appropriate waste containers and transported to the receiving landfill on a regular basis. Sanitary wastewater generated as a result of construction activities would be managed using portable toilet systems. No other nonhazardous liquid wastes are expected.

Operations Impacts—The impacts on the LANL waste management systems, in terms of managing the waste, are discussed in this section. Waste generation rates, by waste type, are summarized in **Table 4–12** for CMRR Facility operations and overall LANL activities. Radioactive solid and liquid wastes from CMRR Facility operations would constitute only a portion of the total amounts of these wastes generated, treated, and/or disposed of at LANL. The radiological and chemical impacts of managing CMRR Facility radioactive waste on workers and the public have been evaluated along with the other LANL site wastes in other environmental documentation (at the time of the 2003 *CMRR SEIS*, the 1999 *LANL SWEIS* (DOE 1999b) included evaluation of these wastes).

Table 4–12 No Action Alternative — Operational Waste Generation Rates Projected for CMRR Facility and Los Alamos National Laboratory Activities

Waste Type	*Units*	*CMRR Facility Generation Rate* [a]	*Site-Wide LANL Projections* [b]
Transuranic and mixed transuranic	Cubic yards per year	88 [c]	440 to 870
Low-level radioactive	Cubic yards per year	2,640 [d]	21,000 to 115,000
Liquid low-level radioactive	Gallons per year	2,700,000	4,000,000
Mixed low-level radioactive	Cubic yards per year	26	320 to 18,100
Chemical [e]	Tons per year	12.4	3,200 to 5,750
Sanitary	Gallons per year	7,200,000 [f]	156,000,000 [g]

CMRR = Chemistry and Metallurgy Research Replacement; LANL = Los Alamos National Laboratory.
[a] DOE 2003b.
[b] Estimated site-wide LANL projections based on estimates included in the 2008 *LANL SWEIS* (DOE 2008a).
[c] Includes both transuranic and mixed transuranic waste.
[d] Volumes of low-level radioactive waste include solid wastes generated by the treatment of low-level radioactive liquid wastes generated by CMRR Facility operations.
[e] Chemical waste is not a formal LANL waste category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this supplemental EIS to denote a variety of materials including hazardous waste regulated under the Resource Conservation and Recovery Act; toxic waste regulated under the Toxic Substances Control Act; and special waste designated under the New Mexico Solid Waste Regulations, including industrial waste, infectious waste, and petroleum-contaminated soil.
[f] Calculated assuming 550 CMRR Facility workers, each generating 50 gallons per day for 260 workdays per year.
[g] The value shown is the annual volume of wastewater processed at the Sanitary Wastewater Systems Plant in TA-46, assuming operation at its 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity for 260 working days per year (DOE 2003b). Sanitary wastewater and nonradioactive liquid waste are both projected to be routed to the Sanitary Wastewater Systems Plant for treatment.
Note: The generation rates are attributed to facility operations and do not include the waste generated from environmental restoration actions.

Transuranic and Mixed Transuranic Wastes

Analytical, processing, fabrication, and research and development activities at the CMRR Facility would generate transuranic waste. Approximately 88 cubic yards (67 cubic meters) of transuranic and mixed transuranic waste would be generated each year. This transuranic and mixed transuranic waste represents about 10 to 20 percent of the total transuranic waste generated annually at LANL. Any transuranic waste generated by CMRR Facility operations would be transported to the Waste Isolation Pilot Plant (WIPP) or a similar facility for disposition. Transuranic waste volumes generated through CMRR Facility operations over the life of the facility are estimated to be less than 2 percent of the WIPP capacity. Offsite disposal capacities for transuranic waste are expected to be adequate for the disposal needs of LANL, including CMRR Facility operations.

Low-Level Radioactive Waste

About 2,640 cubic yards (2,020 cubic meters) of solid low-level radioactive waste would be generated each year from CMRR Facility operations. This represents about 3 to 13 percent of the total low-level radioactive waste generated annually at LANL. Volumes of low-level radioactive waste from CMRR Facility operations include the solid low-level radioactive component of liquid wastes treated through the RLWTF or a similar facility. The impacts of managing this waste at LANL would be minimal.

CMRR Facility operations would also generate liquid low-level radioactive waste. Because the exact amount of liquid low-level radioactive waste that would be generated by the CMRR Facility at TA-55 is not known, the 10,400 gallons (39,400 liters) per day (2.7 million gallons [10 million liters] per year) associated with operations in the CMR Building were estimated to be generated by operations at the CMRR Facility as well. Therefore, the amount of solid low-level radioactive waste that would result from RLWTF treatment of liquid low-level radioactive waste generated by CMRR Facility operations was estimated to be 200 cubic yards (150 cubic meters) annually and is included as low-level radioactive waste in Table 4–12. RLWTF capacity is expected to be sufficient to manage the liquid low-level radioactive waste generated by CMRR Facility operations.

Mixed Low-Level Radioactive Waste

Mixed low-level radioactive waste generated from CMRR Facility operations at TA-55 would be surveyed and decontaminated on site, if possible. Those wastes would be treated on site or stored and processed at TA-54, Area G, or Area L and transported to a commercial or DOE offsite treatment and disposal facility. About 26 cubic yards (20 cubic meters) of mixed low-level radioactive waste would be generated each year. This represents less than 1 to 8 percent of the current mixed low-level radioactive waste generated at LANL. The impacts of managing this waste at LANL would be minimal.

Sanitary Wastewater

Sanitary wastewater generated from CMRR Facility operations at TA-55 would be sent to the Sanitary Wastewater Systems Plant. Approximately 27,500 gallons per day (104,000 liters per day) of sanitary wastewater would be generated for 260 working days per year. This would represent about 4.6 percent of the 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity of the Sanitary Wastewater Systems Plant.

Chemical Waste

Chemical waste generated from CMRR Facility operations at TA-55 would be decontaminated or recycled, if possible. Typically, chemical waste is not held in long-term storage at LANL. Approximately 12.4 tons (11.2 metric tons) of chemical waste would be generated each year. This represents less than 1 percent of the annual chemical waste generation rate for the entire LANL site. The impacts of managing this waste at LANL would be minimal.

4.2.13 Transportation and Traffic

4.2.13.1 Transportation

A transportation impact assessment was conducted for (1) the one-time movement of special nuclear material (SNM), equipment, and other materials during the transition from the existing CMR Building to the 2004 CMRR-NF and (2) the routine onsite shipment of analytical chemistry and materials characterization samples between the Plutonium Facility at TA-55 and the CMRR Facility at TA-55. The results of this impact assessment are presented below for incident-free and transportation accident impacts to the public and workers.

Routine (Incident-Free) Transportation

One-Time Movement of SNM, Equipment, and Other Materials—Transport of SNM, equipment, and other materials currently located at the CMR Building to the 2004 CMRR-NF at TA-55 would occur on open or closed roads. The public is not expected to receive any measurable exposure from the one-time movement of radiological materials associated with this action.

CMR Building workers could receive a minimal dose from shipping and handling of SNM during the transition from the existing CMR Building to the 2004 CMRR-NF. Based on a review of radiological exposure information, the average dose to CMR Building workers (including material handlers) is about 110 millirem per year. The material handler worker dose from shipping and handling of SNM would be similar to those for normal operations currently performed at the CMR Building.

Routine Onsite Shipment of Analytical Chemistry and Materials Characterization Samples—The public is not expected to receive any additional measurable exposure from the movement of small quantities of radioactive materials and SNM samples between the Plutonium Facility at TA-55 and the CMRR Facility at TA-55. These include metal, liquid, or powder samples of weapons-grade plutonium, plutonium-238, uranium-235, uranium-233, and other actinide isotopes.

Transportation Accidents

One-Time Movement of SNM, Equipment, and Other Materials—Potential handling and transport accidents during the one-time movement of SNM, equipment, and other materials during the transition from the existing CMR Building to the 2004 CMRR-NF at TA-55 would be bounded in frequency and consequence by other facility accidents under each of the alternatives presented in this chapter. Once a shipment is prepared for low-speed movement, the likelihood and consequences of any foreseeable accident are considered to be very small.

4.2.13.2 Traffic

Construction Impacts – Truck Traffic—Under the No Action Alternative, construction of the 2004 CMRR-NF would take approximately 3 years. Construction impacts would occur in the time period from 2012 to 2015. This alternative would require excavation of a 68,000-square-foot (6,300-square-meter) area to a depth of 50 feet (15 meters), of which approximately 30 feet (9.1 meters) have already been excavated as part of the geologic analysis of the site, leaving approximately 20 feet (6.1 meters) to be excavated. The excavated soil and rock material would be stored in temporary storage piles assumed to be located approximately 3 miles (4.8 kilometers) from the 2004 CMRR-NF construction site in appropriate storage areas. Excavation of the additional 20 feet and the tunnels to be constructed between RLUOB and the TA-55 Plutonium Facility to the 2004 CMRR-NF would require the removal of approximately 77,000 cubic yards (59,000 cubic meters) of material. This would take approximately 5,000 20-ton truck round trips or 3,300 30-ton truck round trips to move. This material would be staged at a LANL materials staging area for future reuse in other LANL projects.

The number of truck trips per hour would depend on the method used for excavation of the 2004 CMRR-NF. Assuming a 20-minute round trip to the LANL materials staging area, it would take approximately 54 days with one loader and 20-ton trucks or approximately 36 days with one loader and 30-ton trucks to remove the excavated soils and rock. This time period could be shortened by using two loaders, which would be preferable because it would keep trucks operating more efficiently. On a per-hour basis, these trips would be insignificant to the level of service on Pajarito Road. The acceleration of the loaded earthwork trucks would be slow and would result in lower speeds and some reduction in the level of service in the road segment where the trucks accelerate. Pajarito Road is not accessible by the public.

Bulk materials would be delivered to the 2004 CMRR-NF by either standard three-axle dump trucks (20-ton trucks) or five-axle bottom dump trucks (30-ton trucks). This material would be required over the period when the foundation and shell of the 2004 CMRR-NF are being constructed. Approximately 3,200 cubic yards (2,400 cubic meters) of structural concrete and 5,000 cubic yards (3,800 cubic meters) of other concrete would be required (DOE 2003b). To support the concrete batch plant operation for all concrete operations, the following materials would be required (DOE 2003b):

- Approximately 3,700 tons (3,400 metric tons) of coarse aggregate (180 20-ton trucks or 120 30-ton trucks)
- Approximately 3,700 tons (3,400 metric tons) of fine aggregate (sand) (180 20-ton trucks or 120 30-ton trucks)
- Approximately 1,500 tons (1,400 metric tons) of cement (75 20-ton trucks or 50 30-ton trucks)
- Approximately 800 tons (730 metric tons) of fly ash (40 20-ton trucks or 27 30-ton trucks)

The No Action Alternative would also require approximately 270 tons (240 metric tons) of structural steel (14 20-ton trucks or 9 30-ton trucks) (DOE 2003b).

Most of the length of Pajarito Road from TA-63 to White Rock was repaved in October 2010 (LANL 2011). It now consists of an average of 4 inches of asphaltic concrete over 8 inches of aggregate base course. Consideration of the methods contained in the *AASHTO Guide for Design of Pavement Structures* (AASHTO 1993) indicates that this pavement would withstand the expected truck traffic only if the relative quality of the roadbed soil is “very good” according to American Association of State Highway and Transportation Officials standards. If the relative quality of the roadbed soil is less strong, it is possible that the pavement would fail structurally. A second method of failure would be at the edge of the pavement if that edge is not adequately supported laterally. Pajarito Road has 8-foot, paved shoulders, which would provide the necessary lateral support. The roadway shoulders and especially the edges of the shoulders might be subject to damage if trucks were to use the shoulders on a regular basis.

Construction Impacts – Worker Traffic—Under all alternatives, the workers going to the 2004 CMRR-NF are expected to use the public roadways. A peak of 300 workers is anticipated to commute to parking areas. For this analysis, the peak commuting time of these workers would align with the peak-hour traffic on the adjoining public roadways. Three hundred construction workers are anticipated to add an estimated 200 peak-hour trips. These 200 additional commuter vehicles (300 workers) were added to the existing traffic to determine the anticipated level of service. As shown in **Table 4–13**, the impacts on traffic were compared for the year 2012, the year that construction would start, and 2015, the year that construction would be completed. No change in the level of service of roadways in the vicinity of LANL is anticipated during the construction period.

Operations Impacts—The employees currently working at the existing CMR Building and other facilities at LANL are expected to relocate to the CMRR Facility. There would be no impact from traffic or transportation on the internal LANL road system, the vehicle access portals, or the public roadways external to LANL over the existing conditions.

Table 4–13 No Action Alternative — Expected Levels of Service of Roadways in the Vicinity of Los Alamos National Laboratory

Location / Year	Road Type and Number of Lanes	AADT/Year/ Percentage Trucks	Existing Traffic: AADT/ Peak Hour/ LOS 2012	Existing Traffic: AADT/ Peak Hour/ LOS 2015	No Action Alternative: Peak Hour/ LOS 2012	No Action Alternative: Peak Hour/ LOS 2015	Comments (assumed percentage of construction traffic assigned to road segment) (200 VPH)
SR 4 at Los Alamos County Line to SR 501	Minor arterial/ two lanes	734/ 2009/9	760/ 80/A	780/80/A	100/A	100/A	(10) No change in level of service
SR 4 at Junction Bandelier Park Entrance	Minor arterial/ two lanes	681/ 2009/7	700/ 70/A	710/70/A	90/A	90/A	(10) No change in level of service
SR 4 at Junction of Pajarito Road – White Rock	Minor arterial/ two lanes	9,302/ 2009/9	9,580/ 960/D	9,770/ 980/D	1,140/D	1,160/D	(90) No change in level of service
SR 4 at Junction of Jemez Road	Minor arterial/ two lanes	9,358/ 2009/12	9,640/ 960/D	9,830/ 980/D	1,140/D	1,160/D	(90) No change in level of service
SR 501 at Junction of SR 4 to Diamond Drive	Minor arterial/ two lanes	11,848/ 2009/11	12,210/ 1,220/D	12,460/ 1,250/D	1,260/D	1,290/D	(90) No change in level of service
SR 501 at Junction of Diamond Drive and Onward	Primary arterial/ four lanes	21,211/ 2009/8	21,850/ 2,190/C	22,290/ 2,230/C	2,230/C	2,270/C	(90) No change in level of service
SR 501 at Junction 502	Primary arterial/ four lanes – divided	17,807/ 2009/8	18,350/ 1,840/C	18,720/ 1,870/ C	1,940/C	1,970/C	(20) No change in level of service
SR 502 at Junction Openheimer Street	Primary arterial/ four lanes – divided	12,817/ 2009/6	13,210/ 1,320/C	13,480/ 1,350/C	1,420/C	1,450/C	(20) No change in level of service
SR 502 East of Junction with SR 4	Primary arterial/ four-lane freeway	6,341/ 2009/12	6,530/ 650/A	6,660/ 670/A	670/A	690/A	(10) No change in level of service

AADT = average annual daily traffic; LOS = level of service; SR = State Road; VPH = vehicles per hour.

4.3 Environmental Impacts of the Modified CMRR-NF Alternative

4.3.1 Modified CMRR-NF Alternative

This section presents the environmental impacts associated with the Modified CMRR-NF Alternative. This alternative addresses seismic safety and security concerns associated with the No Action Alternative. Among the concerns identified in the seismic and geologic studies is the presence of a subsurface layer of poorly welded volcanic tuff. The layer would need to be removed or modified to provide a stable medium on which to build the Modified CMRR-NF or the facility would be constructed at a sufficient height above this layer. As a result, two construction options are being considered under the Modified CMRR-NF Alternative.

The Deep Excavation Option would involve excavating the identified footprint another 100 feet (30 meters) to a nominal depth of 130 feet (40 meters), thus removing the poorly welded tuff layer. The excavation would then be backfilled with concrete up to 60 feet (18 meters) to provide a stable surface on which to build. The Shallow Excavation Option would involve constructing the Modified CMRR-NF in the stable geologic layer overlying the poorly welded tuff layer, 17 feet (5.2 meters) above the interface between the two layers.

Additional CMRR Project activities analyzed under this alternative include the following (see Chapter 2, Section 2.6):

- TA-50 electrical substation
- TA-72 parking lot
- Pajarito Road realignment and buried utilities relocation activities
- Construction laydown areas and warehouse (TA-46/63 and TA-48/55)
- Construction laydown and support areas (including spoils storage areas) (TA-5/52)
- Concrete batch plants (TA-46/63 and TA-48/55)
- Temporary power upgrades (TA-5 to TA-55)
- Spoils storage areas (TA-36, TA-51, TA-54)
- Stormwater detention ponds (TA-50, TA-63, TA-64)

As under the No Action Alternative, the Modified CMRR-NF would be linked to the newly constructed RLUOB via an underground tunnel, and another underground tunnel would be constructed to connect the TA-55 Plutonium Facility with the Modified CMRR-NF. The vault for long-term storage of SNM would be within the footprint of the Modified CMRR-NF. Chapter 2, Section 2.6.2, provides a complete description of the Modified CMRR-NF Alternative. The impacts of construction and operation of this proposed facility are described in the following sections for both the Deep Excavation Option and the Shallow Excavation Option. Regardless of the construction option, the impacts from operations would not affect the performance of the building once it was constructed. Under either construction option, the resulting building would meet the current standards required for a PC-3 facility so it would perform the same in the event of a seismic accident. The operations impacts discussed below include those from the operation of RLUOB. The impacts of operating the existing CMR Building would continue during the construction of the Modified CMRR-NF at TA-55. In addition, under the Modified CMRR-NF Alternative, there would be a transition period of 3 years, during which operations impacts could exist in whole or in part from both the existing CMR Building and the Modified CMRR-NF. Disposition of this Modified CMRR-NF is discussed in Section 4.5.

4.3.2 Land Use and Visual Resources

4.3.2.1 Land Use

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option of the Modified CMRR-NF Alternative encompasses numerous project elements that would involve both temporary and permanent facilities. These project elements would have the potential to impact land use within TA-5, TA-36, TA-46, TA-48, TA-50, TA-51, TA-52, TA-54, TA-55, TA-63, TA-64, and TA-72. **Table 4–14** lists the various project elements and the technical areas in which they would occur. Also presented in the table are the total acreages involved and the acreage of land that is presently undeveloped, whether the action would be temporary or permanent, the present land use designation of the area in which each project element would occur, and whether there would be a change in land use. Impacts on land use under the Deep Excavation Option for the various project elements are addressed below.

Table 4–14 Modified CMRR-NF Alternative, Deep Excavation Option — Land Use Impacts

Project Element	*Technical Area*	*Acreage (total/undeveloped)*	*Status*	*Present Land Use*	*Change in Land Use*
Pajarito Road realignment	55	3.4/2	P	Reserve	Yes
Electrical substation	50	1.4/1.4	P	Reserve	Yes
Stormwater detention ponds	50	0.5/0.5	P	Reserve	Yes
	64	1/1	T	Reserve	Yes
Spoils storage areas	36	39.1/39.1	T	High Explosives Testing	Yes
	51	9.1/9.1	T	Reserve	Yes
	54	18.6/18.6	T	Reserve	Yes
Parking lot and associated road improvements	72	13–15/13–15	T	Reserve	Yes
Temporary power upgrades	55 through 50, 63, and 52 to 5	9.1/2	T	Along or adjacent to existing rights-of-way within developed areas; however, within TA-52 and -5, the right-of-way is within an area designated Reserve.	No change along portions of the route that are developed; however, land use would change along the portion of the route designated Reserve.
Construction laydown/concrete batch plant	46/63	40/33.5	T	Administrative, Service, and Support (TA-46); Reserve (TA-63)	No (TA-46); Yes (TA-63)
	48/55	20/16	T	Reserve and Experimental Science (TA-48); Theoretical and Computational Science (TA-55)	No (Experimental Science portion of TA-48 and TA-55); Yes (Reserve portion of TA-48)
Construction laydown and support area	5/52	19.1/19.1	T	Reserve	Yes

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; P = permanent; T = temporary.
Note: To convert acres to hectares, multiply by 0.40469.
Source: LANL 2011.

Pajarito Road Realignment—The realignment of a 0.5-mile (0.8-kilometer) section of Pajarito Road south of the Modified CMRR-NF would disturb 3.4 acres (1.4 hectares) of land on the south side of the road, 2 acres (0.8 hectares) of which have not been previously developed, in addition to requiring movement of the buried utilities. The road shift would ensure proper placement of the Modified CMRR-NF perimeter intrusion security fence in proximity to Pajarito Road (LANL 2010d). The undeveloped portion of the affected area is presently designated as Reserve, indicating that it is vacant land not otherwise included in one of the other land use categories (see Chapter 3, Figure 3–14). Thus, this area would be dedicated to transportation and would fall under the Physical and Technical Support land use category and no longer be classified as Reserve. The realignment would not impact operations at any other facilities along Pajarito Road.

Electrical Substation—If needed, the CMRR Project would install a new substation, as analyzed in the 2008 *LANL SWEIS*, on the existing 115-kilovolt power distribution loop in TA-50, just south of the existing RLUOB construction office trailers. The new substation would be a permanent installation that would provide an independent power feed (about 40 megawatts) to the existing TA-55 complex and the Modified CMRR-NF and RLUOB. The substation would require 1.4 acres (0.57 hectares) (LANL 2010d).

This project would result in a permanent change in the land use designation of the area from Reserve to Physical and Technical Support. Instead of installing this substation, another action being evaluated is the installation of a new electrical feed from the TA-3 substation along an existing utilities right-of-way.

Stormwater Detention Ponds—Approximately 1.5 acres (0.6 hectares) would be required for stormwater detention ponds to be located south of Pajarito Road in TA-64 and adjacent to the electrical substation in TA-50. Each of these areas is presently designated as Reserve; however, once the detention ponds are in place, the land use designation would change to Physical and Technical Support. Additional stormwater detention ponds, one temporary and one permanent, would be located within TA-63; however, because they fall within the TA-46/63 laydown areas, their acreage is accounted for in that discussion and is not included here. The existing detention pond at TA-63 that would be enlarged would not experience a change in land use designation.

Spoils Storage Areas—Spoils storage would require a total of 30 acres (12.1 hectares) of land. The space needed for excavated materials storage would not have to be collocated; that is, it could be broken up across available acreage. Thus, a number of areas, not all of which would be needed, have been identified that could be used to stage excavated spoils. The determination of which areas would be used would be made at a later date once the exact construction schedule is developed (LANL 2010d). As indicated in Table 4–14, spoils storage could take place within TA-36, TA-51, and TA-54. Land use within the potential spoils areas in TA-51 and TA-54 is designated Reserve, while land use in TA-36 is designated High Explosives Testing. Thus, the use of any of these areas for spoils storage would change the present land use. Temporary spoils storage areas would be restored to a more-natural state after they are no longer needed, which could lead to a re-establishment of the current land use designation.

Parking Lot—A parking lot and associated road improvements would be constructed in TA-72 along the south side of East Jemez Road, east of the TA-72 firing range. This lot would have 600 to 800 parking spaces and a truck loop area and would require from 13 to 15 acres (5.3 to 6.1 hectares) (LANL 2010d). This area is designated Reserve; thus, its use as a parking lot would result in a change in its land use designation to Physical and Technical Support. This temporary area would be restored to a more-natural state after it is no longer required for Modified CMRR-NF construction. This could lead to a re-establishment of the Reserve land use designation.

Power Upgrades—It would be necessary to upgrade temporary power services for the Modified CMRR-NF construction site and support activities. The power upgrades project would bring in temporary power along a route from the TA-5 eastern technical area substation along Puye Road through TA-5, TA-52, and TA-63, then through TA-50, along Pecos Drive and through a new underground duct to the Modified CMRR-NF site in TA-55. In general, the project would use existing electric utility easements and overhead power poles (LANL 2010d). However, some new overhead poles may be needed, which would disturb an estimated 2 acres (0.8 hectares) of the 9.1 acres (3.7 hectares) total for this activity. The land that would be newly disturbed is primarily in TA-52 adjacent to Puye Road and is presently designated Reserve. Temporary use of this area would change the land use designation to Physical and Technical Support. However, following completion of the Modified CMRR-NF, the power line and poles would be removed and the area would revert to its previous land use designation.

Construction Laydown and Concrete Batch Plants—The Modified CMRR-NF Project would utilize two areas for construction laydown and support services: one would be located in portions of TA-46 and TA-63 and a second would be located in TA-48 and TA-55. Both areas would provide space for construction office trailers, temporary parking, a concrete batch plant, and construction laydown and storage. Both would also be temporary and would include some areas that were formerly used as material storage and laydown sites. The TA-46/63 site covers 40 acres (16.2 hectares) and is designated Administrative, Service, and Support (TA-46) and Reserve (TA-63). The TA-48/55 site covers 20 acres

(8.1 hectares) and is designated Reserve and Experimental Science (TA-48) and Theoretical and Computational Science (TA-55) (LANL 2010d). The use of both construction laydown sites would require some clearing of vegetation and would alter the current land use designation for the duration of the project. However, following construction, the portions of each area currently designated as Reserve would be restored and revert to that designation.

Construction Laydown and Support Area—Construction support would require an area of 19.1 acres (7.7 hectares) within TA-5/52. This area could be used for a variety of construction-related needs, including storage of equipment and spoils. The use of this area during construction of the Modified CMRR would result in a change in its present Reserve land use designation. However, upon completion of construction, the area could be restored to its present condition, thus leading to the re-establishment of its current land use designation.

Construction Impacts – Shallow Excavation Option—Construction of the Modified CMRR-NF under the Shallow Excavation Option would entail the same project elements noted above under the Deep Excavation Option. However, only 10 acres (4 hectares) would be required for spoils storage. Further, the potential spoils storage areas being considered for this option would only include the 19.1-acre (7.7-hectare) site in TA-5/52 and the 9.1-acre (3.7-hectare) site in TA-51. A determination of which areas would be used would be made at a later date after the exact construction schedule is developed (LANL 2010d).

Operations Impacts—Under both of the Modified CMRR-NF Alternative construction options, there would be a land commitment associated with facility operations of 28.1 acres (11.4 hectares), including 4.8 acres (1.9 hectares) for the Modified CMRR-NF, 4 acres (1.6 hectares) for RLUOB, 13 acres (5.3 hectares) for the TA-50 parking lot, 3.4 acres (1.4 hectares) for the Pajarito Road realignment, 1.4 acres (0.6 hectares) for the electrical substation, and 1.5 acres (0.6 hectares) for stormwater detention ponds. There would be no additional change in land use as a result of operations of the Modified CMRR-NF and RLUOB because any changes that would take place would have already occurred during construction.

4.3.2.2 Visual Resources

Construction Impacts – Deep Excavation Option—A general description of the appearance of each technical area affected by the proposed action and alternatives is presented in Chapter 3, Table 3–2. Project elements undertaken under the Deep Excavation Option of the Modified CMRR-NF Alternative would affect the appearance of the individual technical areas in which they would take place. More importantly, when taken together, they have the potential to affect the overall visual environment of LANL. Most development under this option would occur along the central portion of the Pajarito Road corridor; however, spoils storage could occur to the east in TA-36, TA-51, and TA-54. Additionally, a parking lot would be located in TA-72.

As much of the proposed development associated with the various project elements that would take place under the Deep Excavation Option for the Modified CMRR-NF Alternative would occur within or adjacent to developed areas along the central Pajarito Road corridor, there would be little overall change in the industrial appearance of the area. New construction in these areas would generally take place within or adjacent to previously developed areas; thus, it would not represent a significant change in the visual environment. Because Pajarito Road is closed to the public, near views of CMRR-related development along the roadway would be restricted to site workers. As viewed from higher elevations to the west, new development along the central portion of Pajarito Road would result in little change to the area's present appearance. Further, new required lighting would not noticeably change the present nighttime appearance of the site. Overall, there would be no change in the current U.S. Bureau of Land Management (BLM) Visual Resource Contrast Class IV rating along the central portion of Pajarito Road. Visual impacts to the east along Pajarito Road in the vicinity of TA-36, TA-51, and TA-54 could be more noticeable because this portion of the roadway has little adjacent development. Because many project elements are temporary in nature, visual impacts would decrease once the construction phase of the Modified CMRR-NF project is complete and temporarily disturbed areas are restored to a more-natural appearance.

One project element that would be located some distance from the Pajarito Road corridor under this alternative is the TA-72 parking lot, which would be built approximately 0.75 miles (1.2 kilometers) west of the intersection of East Jemez Road and New Mexico State Road 4. Construction of the 13- to 15-acre (5.3- to 6.1-hectare) parking lot would require removal of all vegetation, as well as leveling the site, which would change its natural appearance. The parking lot would be readily seen by both site workers and the general public because traffic along the road is not restricted, as it is along Pajarito Road. In addition, because it would be lit at night, it would be readily seen from East Jemez Road, and the nighttime sky glow would be visible from New Mexico State Road 4 and the Tsankawi Unit of Bandelier National Monument. It would also be readily seen from nearby higher elevations. Installed lighting would comply with the New Mexico Night Sky Protection Act to the extent that it would not compromise security. Development of this part of TA-72 would result in a change in the BLM visual resource contrast rating from Class III to a Class IV. Following completion of the Modified CMRR-NF, the parking lot would be restored to a more-natural state. However, it would take years before the area would return to its predisturbance appearance.

Construction Impacts – Shallow Excavation Option—Impacts on visual resources resulting from implementation of the Shallow Excavation Option would be similar to those described under the Deep Excavation Option. However, only 10 acres (4 hectares) within TA-5/52 and TA-51 would be needed for spoils storage. Thus, overall visual impact of the project during the period when spoils would be stored would be less than under this option compared with the Deep Excavation Option.

Operations Impacts—Once the Modified CMRR-NF becomes operational and the spoils storage area(s) is closed and restored to a more-natural state, the appearance of the involved technical areas under both options for the Modified CMRR-NF Alternative would approximate preconstruction conditions. The Modified CMRR-NF itself, excluding the cupola roofs, would range from about 20 feet (6 meters) to 55 feet (17 meters) above ground, which would primarily be viewed by LANL employees because Pajarito Road is closed to the public. When viewed from higher elevations to the west, the Modified CMRR-NF and RLUOB would blend in with existing development along the central portion of Pajarito Road. Their presence would not change the BLM Visual Resource Contrast Class IV rating.

4.3.3 Site Infrastructure

Construction Impacts – Deep Excavation Option—Planned and proposed construction activities (see **Table 4–15**) are expected to have a temporary effect on the electrical power requirements at LANL. During the construction phase (about 9 years), the temporary increase in power would be approximately 5 percent of the available (surplus) energy capacity at LANL and would not impact the available energy supply to any current or projected uses. The temporary increase in the peak load demand would be approximately 46 percent of the available (surplus) capacity. With planned upgrades and modifications (see Chapter 2, Section 2.6.2), existing infrastructure would be capable of supporting the construction requirements for the Modified CMRR-NF proposed under this alternative without exceeding site capacities.

No natural gas would be needed for construction of the Modified CMRR-NF. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource for the purposes of this SEIS.

Primary construction water use would be for concrete, site preparation, and earthwork (for example, grading, compaction, dust control). There would be a temporary effect on the water supply at LANL. During the construction phase, it was estimated that approximately 5 million gallons (19 million liters) of water per year (42 million gallons total [159 million liters]) would be needed. This would be approximately 4 percent of the available (surplus) capacity at LANL. The volume of groundwater that would be used is within the retained water right quantity at LANL, which is figured on an annual use ceiling of 542 million gallons (2,000 million liters). However, the site is currently at a baseline of 76 percent of the available capacity due to other site requirements. With the proposed construction included, the site would be at 76.9 percent of capacity. The ROI, which includes water used by LANL and Los Alamos County, is over 91 percent; with the proposed construction included, the total ROI would be at 91.8 percent of capacity.

Table 4–15 Modified CMRR-NF Alternative, Deep Excavation Option — Site Infrastructure Requirements for Facility Construction

Resource	*Available Site/System Capacity* [a]	*CMRR-NF Project Requirement*	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	601,000	31,000	5
Peak load demand (megawatts)	26	12	46
Fuel			
Natural gas (million cubic feet per year)	5,860	Not applicable	Not applicable
Water (million gallons per year)	130	5	4

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] A calculation based on the system-wide (site-wide for water) capacity from data provided in Chapter 3, Table 3–3, of this SEIS.
Source: LANL 2011.

Construction Impacts – Shallow Excavation Option—Planned and proposed construction activities (see **Table 4–16**) are expected to have a temporary effect on the electrical power requirements. During the construction phase (about 9 years),[4] the temporary increase in power would be approximately 5 percent of the available (surplus) energy capacity and would not impact the available energy supply to any current or projected uses. The temporary increase in the peak load demand would be approximately 46 percent of the available (surplus) capacity. With planned upgrades and modifications, existing infrastructure would be capable of supporting the construction requirements of the Modified CMRR-NF proposed under this alternative without exceeding site capacities.

No natural gas would be needed for construction of the Modified CMRR-NF. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource for the purposes of this SEIS.

[4] *The construction period is the same regardless of the construction option; the additional excavation required for the Deep Excavation Option would occur in parallel with other activities (for example, preparing laydown areas and installing construction utilities) that would occur under both options.*

Table 4–16 Modified CMRR-NF Alternative, Shallow Excavation Option — Site Infrastructure Requirements for Facility Construction

Resource	*Available Site/System Capacity* [a]	*CMRR-NF Project Requirement*	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	601,000	31,000	5
Peak load demand (megawatts)	26	12	46
Fuel			
Natural gas (million cubic feet per year)	5,860	Not applicable	Not applicable
Water (million gallons per year)	130	4	3

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] A calculation based on the system-wide (site-wide for water) capacity from data provided in Chapter 3, Table 3–3, of this SEIS.
Source: LANL 2011.

Similar to the Deep Excavation Option, there would be a temporary effect on the water supply at LANL. During the construction phase (about 9 years), it was estimated that approximately 4 million gallons (15 million liters) of water per year (35 million gallons [130 million liters] total) would be needed. This temporary increase in water use would be approximately 3 percent of the available (surplus) capacity at LANL. The volume of groundwater that would be used is within the retained water right quantity at LANL, which is figured on an annual use ceiling of 542 million gallons (2,000 million liters). However, the site is at a baseline of 76 percent of the available capacity due to other site requirements. With the proposed construction included, the site would be at 76.7 percent of capacity. The ROI, which includes water used by LANL and Los Alamos County, is over 91 percent; with the proposed construction included, the ROI would be at 91.7 percent of capacity.

Operations Impacts—Resources needed to support the projected demands on key site infrastructure resources associated with CMRR Facility operations under the Modified CMRR-NF Alternative are presented in **Table 4–17**. CMRR-NF and RLUOB operations together would require 161,000 megawatt-hours per year, or approximately 27 percent of the available (surplus) energy capacity. The peak electrical demand estimate of 26 megawatts, when combined with the projected site-wide peak demand, would use all of the available (surplus) capacity at the site. Regardless of the decisions to be made regarding the CMRR-NF, adding a third transmission line and/or reconductoring the existing two transmission lines are being studied by LANL to increase transmission line capacities up to 240 megawatts to provide additional capacity across the site. If the proposed TA-50 electrical substation is constructed, it would provide reliable additional electrical power as the independent power feed to the existing TA-55 complex and the CMRR Facility. LANL is also considering establishing an independent power feed to the existing TA-55 complex and the CMRR Facility from TA-3 along existing utility rights-of-way. If additional capacity and reliability can be added to the existing TA-3 substation, this would negate the need to build the proposed TA-50 substation.

Natural gas is used to supply boilers and emergency generators, but is restricted to the utility building attached to RLUOB. The required amount would only use about 1 percent of the available site capacity.

Table 4–17 Modified CMRR-NF Alternative — Site Infrastructure Requirements for Modified CMRR-NF and RLUOB Operations

Resource	*Available Site/System Capacity* [a]	*CMRR Facility Requirement*	*Percentage of Available Site Capacity*
Electricity			
RLUOB energy (megawatt-hours per year)		59,000	
Modified CMRR-NF energy (megawatt-hours per year)		102,000	
Modified CMRR-NF and RLUOB energy (megawatt-hours per year)	*601,000*	*161,000*	*27*
RLUOB peak load demand (megawatts)		11	
Modified CMRR-NF peak load demand (megawatts)		15	
Modified CMRR-NF and RLUOB peak load demand (megawatts)	26	26	100
Fuel (million cubic feet per year)			
RLUOB natural gas		38	
Modified CMRR-NF natural gas		20	
Modified CMRR-NF and RLUOB natural gas	5,860	58	1.0
Water (million gallons per year)			
RLUOB water		*7*	
Modified CMRR-NF water		*9*	
Modified CMRR-NF and RLUOB water	*130*	*16*	*12*

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] A calculation based on the system-wide (site-wide for water) capacity from data provided in Chapter 3, Table 3–3, of this SEIS.

Source: LANL 2011.

Under this alternative, water would be needed for building mechanical uses, including a demineralization system, and to meet the potable and sanitary needs of facility support personnel. It was estimated that Modified CMRR-NF and RLUOB operations would require about 16 million gallons (61 million liters) of groundwater per year. During operations, the increase in water would be approximately 12 percent of the available (surplus) capacity at LANL. The volume of groundwater that would be used is within the retained water right quantity at LANL, which is figured on an annual use ceiling of 542 million gallons (2,000 million liters). However, the site is at a baseline of 76 percent of capacity. With the proposed operations included, the site would be at 79 percent of capacity. The ROI, which includes water used by LANL and Los Alamos County, is at over 91 percent; with the proposed Modified CMRR-NF and RLUOB operations included, the ROI would be at 92.4 percent of capacity.

4.3.4 Air Quality and Noise

4.3.4.1 Air Quality

For both of the construction options considered under the Modified CMRR-NF Alternative, air quality emissions were calculated for construction activities, transport of materials to and from the work site, transport of personnel from the proposed parking area in TA-72 to the work site, and production of concrete from the temporary batch plants that would be located on site. A detailed discussion of calculation methods is included in Appendix B. Nonradiological air emissions are discussed for both options. No radiological emissions would occur during the construction phase.

Construction permits for nonradiological air emissions would be required. Specifically, emissions from combustion sources and concrete batch plant would require construction permits from the New Mexico

Environment Department. In addition, pre-construction approval from EPA would be required for radioactive air emissions, in accordance with 40 CFR Part 60, Subpart H. Due to the LANL site-wide operating permit discussed in Chapter 3, Section 3.4.2, a Prevention of Significant Deterioration permit would not be required. It is expected that the LANL site-wide Title V operating permit would require future modification to incorporate permit requirements for construction of the Modified CMRR-NF.

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option would result in temporary emissions from construction equipment, trucks transporting materials, and employee vehicles. Criteria pollutant concentrations at the boundary of TA-55 due to construction activities and at the LANL boundary due to the transport of people and materials were compared to the New Mexico Ambient Air Quality Standards, which are more stringent than the National Ambient Air Quality Standards (see **Table 4–18**). Construction emissions would not exceed the New Mexico Ambient Air Quality Standards or the National Ambient Air Quality Standards for any of the criteria pollutants. These levels are based on the concentrations expected at the boundary of TA-55 during active construction. Actual criteria pollutant concentrations are expected to be less because emission factors were used to complete modeling of construction and associated activities that tend to overestimate impacts. The model generates concentrations based on assumptions for a worst-case scenario. The public would not be allowed access to this area during construction. Emissions calculated to determine potential impacts on the nearest residents located at the Royal Crest Trailer Park, north of the project site, found pollutant concentrations to be well below the most stringent standards. Criteria pollutant concentrations would not exceed the most stringent standards during construction activities or transport of materials to and from the site. Mitigation actions were not considered in the analysis. Actual concentrations are expected to be less than predicted.

Table 4–18 Modified CMRR-NF Alternative, Deep Excavation Option — Pollutant Emissions Compared to New Mexico State Standards

Criteria Pollutant	*Averaging Time*	*NMAAQS [a] (parts per million)*	*Calculated Concentration (parts per million)*			
			Construction [b]	*Concrete Batch [c]*	*Materials Transport [d]*	*Personnel Transport [d]*
Carbon monoxide	1 hour	13	0.31	N/A	0.18	<<0.01
	8 hours	8.7	0.22	N/A	0.12	<<0.01
Nitrogen dioxide	Annual	0.05	0.02	N/A	<<0.01	<<0.01
Sulfur dioxide	3 hours	0.5 [e]	0.06	N/A	<<0.01	<<0.01
	24 hours	0.1	0.01	N/A	<<0.01	<<0.01
	Annual	0.02	<<0.01	N/A	<<0.01	<<0.01
PM_{10}	24 hours	150 μg/m³ [e]	15 μg/m³	0.26 μg/m³	10 μg/m³	0.06 μg/m³
Total suspended particulates	24 hours	150 μg/m³	15 μg/m³	0.26 μg/m³	10 μg/m³	0.06 μg/m³
	Annual	60 μg/m³	3.0 μg/m³	0.05 μg/m³	2.0 μg/m³	0.01 μg/m³

<< = much less than; μg/m³ = micrograms per cubic meter; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; N/A = not applicable; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAQB 2010.

[b] Construction emissions were modeled using TA-55 as the total area in which pollutants are distributed.

[c] Concrete batch plant emissions were modeled using the area of Technical 63 in which pollutants are distributed.

[d] Emissions from mobile sources were modeled using an area that would encompass the length of road used.

[e] EPA 2010c. There are no NMAAQS for PM_{10}; therefore, NAAQS are used here.

The following corrective actions may be used to decrease construction-related emissions. In addition to standard construction emissions controls, emissions from construction equipment may be mitigated by maintaining the equipment to ensure that the emissions control systems and other components are functioning at peak efficiency. Exposed soil during construction activities is a source of particulate matter (fugitive dust) and may be controlled with routine watering. Application of chemical stabilizers to exposed areas and administrative controls such as planning, scheduling, and the use of special equipment could further reduce emissions.

Radiological releases from construction activities are not expected. As described in Section 2.5, the RLUOB has been constructed and the CMRR-NF site has been excavated down to about 30 feet (9.1 meters) already and no contamination was encountered. Any suspected or known contaminated areas from prior LANL activities would be evaluated to identify procedures for working within those areas and to determine the need to remove site contamination. Contaminated soils would be removed as necessary to protect worker health or the environment before construction was initiated. Any contaminated soil removed would characterized and disposed of appropriately at LANL or an offsite waste management facility.

Construction Impacts – Shallow Excavation Option—The Shallow Excavation Option for the Modified CMRR-NF would also include construction, production of concrete via temporary batch plants, and the transport of personnel and materials to and from the site. Criteria pollutant emissions under the Shallow Excavation Option are summarized in **Table 4–19**. Annual construction and personnel transport emissions are predicted to be comparable to those under the Deep Excavation Option. Less concrete is needed for this option; thus, less particulate matter emissions from the batch plants are expected. Similar to the Deep Excavation Option, criteria pollutant concentrations would not exceed the most stringent standards during construction activities and transport of materials to and from the site. Emissions calculated to determine potential impacts on the nearest residents located at the Royal Crest Trailer Park, north of the project site, found pollutant concentrations to be well below the most stringent standards.

Table 4–19 Modified CMRR-NF Alternative, Shallow Excavation Option — Criteria Pollutant Emissions Compared to New Mexico State Standards

Criteria Pollutant	*Averaging Time*	*NMAAQS [a] (parts per million)*	*Calculated Concentration (parts per million)*			
			Construction [b]	*Concrete Batch [c]*	*Materials Transport [d]*	*Personnel Transport [d]*
Carbon monoxide	1 hour	13	0.31	N/A	0.11	<<0.01
	8 hours	8.7	0.22	N/A	0.07	<<0.01
Nitrogen dioxide	Annual	0.05	0.02	N/A	<<0.01	<<0.01
Sulfur dioxide	3 hours	0.5 [e]	0.06	N/A	<<0.01	<<0.01
	24 hours	0.1	0.01	N/A	<<0.01	<<0.01
	Annual	0.02	<<0.01	N/A	<<0.01	<<0.01
PM_{10}	24 hours	150 μg/m[e]	15 μg/m³	0.19 μg/m³	6.0 μg/m³	0.06 μg/m³
Total suspended particulates	24 hours	150 μg/m³	15 μg/m³	0.19 μg/m³	6.0 μg/m³	0.06 μg/m³
	Annual	60 μg/m³	3.0 μg/m³	0.04 μg/m³	1.2 μg/m³	0.01 μg/m³

<< = much less than; μg/m^3 = micrograms per cubic meter; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; N/A = not applicable; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAQB 2010.

[b] Construction emissions were modeled using TA-55 as the total area in which pollutants are distributed.

[c] Concrete batch plant emissions were modeled using the area of TA-63 in which pollutants are distributed.

[d] Emissions from mobile sources were modeled using an area that would encompass the length of road used.

[e] EPA 2010b. There are no NMAAQS for PM_{10}; therefore, National Ambient Air Quality Standards are used here.

Operations Impacts—Operations impacts from nonradiological and radiological emissions under the Modified CMRR-NF Alternative would be the same as those estimated under the No Action Alternative (see Section 4.2.4.1). **Table 4–20** summarizes the concentrations of criteria pollutants from operations at the Modified CMRR-NF and RLUOB. The maximum ground-level concentrations that would result from Modified CMRR-NF and RLUOB operations at TA-55 would be below ambient air quality standards.

Table 4–20 Modified CMRR-NF Alternative — Nonradiological Air Quality Concentrations at Technical Area 55 Site Boundary – Operations

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)* [a]	*Calculated Concentration (parts per million)* [b]
Carbon monoxide	1 hour	13	0.027
	8 hours	8.7	0.060
Nitrogen dioxide	Annual	0.05	1.2×10^{-5}
Sulfur dioxide	3 hours	0.5 [c]	0.10
	24 hours	0.1	0.014
	Annual	0.02	5.5×10^{-6}
PM_{10}	24 hours	150 µg/m³	1.4 µg/m³
Total suspended particulates	24 hours	150 µg/m³	2.4 µg/m³
	Annual	60 µg/m³	0.0 µg/m³

µg/m³ = micrograms per cubic meter; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAAQS are more stringent than the Federal standards; thus, emissions are compared to the latest NMAAQS consistent with other air quality analyses in this SEIS. All emissions were converted from micrograms per cubic meter, as shown in Table 4–10 of the *CMRR EIS*, to parts per million using the appropriate corrections for temperature (70 degrees Fahrenheit) and a site elevation of 7,229 feet, in accordance with New Mexico dispersion modeling guidelines (NMAQB 2010).

[b] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[c] NMAAQS does not have a 3-hour standard; thus, the Federal standard (from the NAAQS) is used here.

Source: DOE 2003a.

4.3.4.2 Greenhouse Gas Emissions

Construction Impacts – Deep Excavation Option—Under the Deep Excavation Option, construction of the Modified CMRR-NF at TA-55 would result in temporary greenhouse gas emissions from construction equipment, material transport trucks, personnel commutes, and electricity consumption. Operation of the concrete batch plants would not require natural gas, but would require electricity, which is accounted for in the total electricity use presented in **Table 4–21**.

Emissions of greenhouse gases (see Table 4–21) from these construction activities, excluding electricity use, were estimated to be approximately 12,400 tons of carbon-dioxide equivalent (11,200 metric tons) per year. Compared to the 2008 site-wide greenhouse gas baseline emissions, about 440,000 tons (400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011)[5], there would be a minimal and temporary increase (about 2.8 percent) in greenhouse gases from the construction of the Modified CMRR-NF under the Deep Excavation Option.

[5] *The projected LANL site-wide greenhouse gas emissions associated with the electrical usage corresponding to the operations selected in the 2008* LANL SWEIS *RODs would be 543,000 tons per year.*

Table 4–21 Modified CMRR-NF Alternative, Deep Excavation Option — Construction Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*			
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*Total CO_2e*
Scope 3 [a]	Sitework/grading	2,500	0	5	2,500
	Construction	2,500	3	40	2,540
	Materials transport	6,000	1	10	6,010
	Personnel commutes	1,250	2	27	1,280
	Subtotal	12,300	6	82	12,400
Scope 2 [b]	Electricity Use	20,000	6	86	20,100
	Total	32,300	12	168	32,500

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent.

[a] Scope 3 sources include indirect emissions of construction equipment not owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding.

Total greenhouse gases from construction activities, including electricity consumption, would be approximately 32,500 tons of carbon-dioxide equivalent per year (29,000 metric tons per year). Electricity use during construction of the Modified CMRR-NF Alternative, Deep Excavation Option, would be approximately 5 percent of the total site-wide carbon-dioxide-equivalent emissions.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 25,000 metric tons or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but a minimum level that would require consideration in NEPA documentation. There are no direct, or Scope 1, greenhouse gas emissions during construction under the Modified CMRR-NF Alternative, Deep Excavation Option.

Construction Impacts – Shallow Excavation Option—Under the Shallow Excavation Option, construction at TA-55 would result in temporary greenhouse gas emissions from construction equipment, material transport trucks, personnel commutes, and electricity consumption. Operation of the concrete batch plants would not require natural gas, but would require electricity. Construction and personnel transport emissions annually are similar to the Deep Excavation Option, but with lower emissions from fewer truck trips. Emissions of greenhouse gases (see **Table 4–22**) from these construction activities were estimated to be approximately 10,900 tons (9,900 metric tons) of carbon-dioxide equivalent per year.

Total greenhouse gases from construction activities, including electricity consumption, would be approximately 31,000 tons of carbon-dioxide equivalent (28,000 metric tons) per year. The electricity use during construction of the Modified CMRR-NF Alternative, Shallow Excavation Option, is approximately 5 percent of the total site-wide carbon-dioxide-equivalent emissions. As with the Deep Excavation Option, there are no direct, or Scope 1, greenhouse gas emissions during construction under the Modified CMRR-NF Alternative, Shallow Excavation Option.

Table 4–22 Modified CMRR-NF Alternative, Shallow Excavation Option — Construction Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*			
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*Total CO_2e*
Scope 3 [a]	Sitework/grading	2,500	0	5	2,500
	Construction	2,500	3	40	2,540
	Materials transport	4,600	0	10	4,610
	Personnel commutes	1,200	2	26	1,250
	Subtotal	10,800	5	81	10,900
Scope 2 [b]	Electricity use	20,000	6	86	20,100
	Total	30,800	11	167	31,000

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2= carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent.

[a] Scope 3 sources include indirect emissions of construction equipment not owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding.

Operations Impacts—Greenhouse gas emissions during operations of both the CMRR-NF and RLUOB from refrigerants used to cool the building and backup generators are approximately 1,860 tons (1,700 metric tons) per year of carbon-dioxide equivalent. Since there would be no new hires under this alternative, emissions from personnel commutes (Scope 3) already included in the baseline are not included here. Compared to the site-wide greenhouse gas emissions, about 440,000 tons (400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011), there would be a minimal increase (less than 1 percent) in greenhouse gases on site from normal operations of the Modified CMRR-NF and RLUOB.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 25,000 metric tons or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but a minimum level that would require consideration in NEPA documentation. The only direct (Scope 1) greenhouse gas emissions during operations of the CMRR-NF and RLUOB under the Modified CMRR-NF Alternative would be from backup generators and refrigerants used to cool the building. Together, the Scope 1 emissions during operation of CMRR-NF and the RLUOB under the Modified CMRR-NF Alternative, approximately 1,860 tons (1,700 metric tons), would be below the CEQ suggested level of 25,000 metric tons per year.

Total greenhouse gases, including both indirect (Scope 2 and 3) and direct (Scope 1) emissions, during operation of the CMRR-NF and RLUOB would be approximately 107,000 tons (97,000 metric tons) of carbon-dioxide equivalent per year (see **Table 4–23**). This is approximately 25 percent of the total site-wide carbon-dioxide-equivalent emissions per year. These greenhouse gases emitted by operations under the Modified CMRR-NF Alternative would add a relatively small increment to emissions of these gases in the United States and the world (see Section 4.6).

Table 4–23 Modified CMRR-NF Alternative — Modified CMRR-NF and RLUOB Operations Emissions of Greenhouse Gases

Emissions Scope	Activity	Emissions (tons per year)				
		CO_2	CH_4 CO_2e	N_2O CO_2e	HFC CO_2e	Total CO_2e
Scope 1 [a]	Refrigerants used	N/A	N/A	N/A	1,860	1,860
	Backup generator	3	0	0	N/A	3
Subtotal		3	0	0	1,860	1,860
Scope 2 [b]	Electricity use	105,000	30	450	N/A	105,000
Total		105,000	30	450	1,860	107,000

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N/A = not applicable; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; HFC CO_2e = hydrofluorocarbons in carbon-dioxide equivalent; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Scope 1 sources include direct emissions by stationary sources owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generators of purchased electricity, where the emissions actually occur at sources off site and not owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding.

4.3.4.3 Noise

Construction noise was evaluated using RCNM [Roadway Construction Noise Model], Version 1.1, the Federal Highway Administration's standard model for the prediction of construction noise (DOT 2006). RCNM has the capability to model types of construction equipment that are expected to be the dominant construction-related noise sources associated with this action. All construction noise analyses were assumed to make use of a standard set of construction equipment. Construction noise impacts are quantified using the 8-hour noise level equivalent ($L_{eq[8]}$) noise metric, as calculated on an average busy working day during construction. The maximum sound level (L_{max}) shows the sound level of the loudest piece of equipment, which is generally the driver of the $L_{eq(8)}$ sound level.

Construction noise was evaluated for one construction site; this evaluation may be applied to each of the sites individually as an assessment of the potential negative effects on sensitive receptors in the vicinity of the construction site. Construction noise was evaluated at 100-foot increments from the construction equipment. Noise abatement measures were not considered in this analysis, which provides for a more-conservative analysis. The same types of equipment were assumed to be used on each construction site. At noise levels greater than 65 decibels A-weighted (dBA), the potential for annoyance increases, and at levels above 75 dBA, possible harm to health may occur; thus, noise levels above 65 dBA were used as the significance threshold. **Table 4–24** shows the noise levels expected at receptor distances at 100-foot increments and the residential area 0.6 miles (1.0 kilometer) north of TA-55.

Construction Impacts – Deep Excavation Option—On site, all workers potentially exposed to elevated noise associated with their activities would comply with all hearing-protective requirements specified by OSHA. Any other personnel visiting on site also would adhere to the OSHA standards for hearing protection.

Off site, noise experienced on a day-to-day basis depends on the specific activity under way and its proximity to the site edge, where a receptor may be present. Nevertheless, the relatively low time-averaged noise levels calculated indicate that project-related construction activities would not be excessively intrusive.

Table 4–24 Modified CMRR-NF Alternative — Noise Levels During Modified CMRR-NF Construction

Distance from Equipment (feet)	*Maximum Sound Level (L_{max}) [a] dBA*	*Equivalent Sound Level (L_{eq}) [b] dBA*
100	79	81
200	73	75
300	69	72
400	67	69
500	65	67
1000	59	61
Residential area [c]	49	51

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; dBA = decibels A-weighted.
[a] Calculated maximum sound level is the loudest equipment value.
[b] Equivalent sound level is the sound averaged over an 8-hour period.
[c] Residential area located approximately 0.6 miles (1 kilometer) north of TA-55.

The areas involving construction are situated within areas already exposed to some form of noise from vehicular highway traffic. Construction noise emanating off site would probably be noticeable in the immediate site vicinity, but is not expected to create adverse impacts. Construction-related noise is intermittent and transitory and would cease at the completion of the project. Construction noise would have no adverse effects on residents with construction noise levels of 51 dBA. No adverse effects of construction noise are expected.

Construction Impacts – Shallow Excavation Option—Noise under the Shallow Excavation Option would be the same as shown under the Deep Excavation Option. This option would be completed in the same amount of time as the Deep Excavation Option; because of the distance to the exposed public, no differences in effects from construction noise are expected.

Operations Impacts—Operations of the Modified CMRR-NF and RLUOB would have noise levels similar to those of existing operations at TA-55. A slight increase in traffic and equipment (such as heating and cooling systems) noise near the area is expected. These noise levels would not cause adverse impacts on wildlife or the public located outside of LANL.

4.3.5 Geology and Soils

Construction Impacts – Deep Excavation Option

Ground Disturbance. Under the Deep Excavation Option, minimal additional land would be disturbed at TA-55. RLUOB has already been constructed adjacent to the proposed Modified CMRR-NF site, and up to 30 feet (9 meters) of the 130-foot (40-meter) excavation required for the Deep Excavation Option of the Modified CMRR-NF has already been completed as part of the geologic evaluation of the site. Additional land disturbance at TA-55 would primarily be associated with installation and construction of infrastructure associated with the Modified CMRR-NF, such as buried utilities and security fence relocation. However, other aspects of the project would result in additional land disturbance (see Section 4.3.2.1).

This construction option requires the excavation of an additional 100 feet (30 meters) of bedrock for construction of the Modified CMRR-NF, as approximately 30 feet (9 meters) of the Modified CMRR-NF excavation has already been completed. Some of the material excavated from TA-55 would be reused as fill for other Modified CMRR-NF infrastructure and construction support-related projects, such as fill for the TA-46/63 and TA-48/55 laydown areas. The remaining amount would be staged at a LANL materials staging area for future reuse on other LANL projects. Reuse of this material at LANL would directly offset the future need to transport purchased fill material from offsite locations, as is currently the case because of the limited amount of suitable fill material available within existing LANL borrow pits.

Although many of the areas to be developed are previously disturbed, the following actions would expose soils to wind and water erosion: removal of vegetation, grading for new laydown areas, and temporary stockpiling of soils adjacent to utility trenches and other infrastructure excavations and in staging areas. See Section 4.3.6 for more information related to erosion impacts. The 2008 *LANL SWEIS* analyzed impacts associated with management of 150,000 cubic yards (115,000 cubic meters) per year of spoils from the Modified CMRR-NF site and other construction projects at LANL (DOE 2008a).

Aggregate Supply. Large tonnages of aggregate would be required to support construction activities at TA-55. Approximately 313,000 tons (284,000 metric tons) of coarse aggregate and 320,000 tons (290,000 metric tons) of fine aggregate (sand) would be required to support all concrete operations, including placement of up to 250,000 cubic yards (227,000 cubic meters) of low-slump concrete fill material in the lower 60 feet (18 meters) of the Modified CMRR-NF excavation.

Additional excavation under the Deep Excavation Option would require the removal of approximately 545,000 cubic yards (417,000 cubic meters) of material. Such material would be suitable for construction backfill for this project, as well as for construction projects located throughout LANL, but it is unlikely that the characteristics of this material would make it suitable as aggregate for concrete. Similarly, the East Jemez Road Borrow Pit, located in TA-61, which represents good source material for certain construction purposes, is not anticipated to be used as a source for Modified CMRR-NF construction purposes. For purposes of analysis, aggregate for concrete was assumed to come from sources within 100 miles (160 kilometers) of LANL. Aggregate would be procured from existing commercial vendors operating in accordance with all necessary permits. As practical, nearer sources of materials would be used. There are numerous commercial offsite borrow pits and quarries in the vicinity of LANL, including 11 pits or quarries located within 30 miles (48 kilometers) of LANL.

Seismicity. As discussed in Chapter 3, Section 3.5.4, in 2007, the *Final Report, Update of the Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory (Probabilistic Seismic Hazards Analysis)* (LANL 2007a), was issued, which provided a better assessment of the seismic behavior during a design-basis earthquake. As a result, the hazard assessment for the site of the proposed Modified CMRR-NF has been updated so that these data could be used during facility design to meet DOE orders, requirements, and governing standards.

Based on the updated seismic hazard analysis, the geotechnical properties of the bedrock (the structural stability of the rock) at the proposed Modified CMRR-NF location have been further evaluated with respect to the proposed Modified CMRR-NF structure and associated depth of excavation. As discussed in Chapter 3, Section 3.5.2, approximately 700 feet (210 meters) of Bandelier Tuff is present beneath the site. The Modified CMRR-NF excavation would be affected by the uppermost units of this geologic formation, consisting of Units 3 (Qbt3) and 4 (Qbt4) of the Tshirege Member of the Bandelier Tuff (see Chapter 2, Figure 2–7). In comparison to the units above and below, the lower part of Unit 3 ($Qbt3_L$) has lower bearing capacity, is more compressible, has higher porosity, and has less cohesion. These rock properties, coupled with the vertical proximity of Unit 3 to the Modified CMRR-NF foundation grade and its lateral proximity to the slope of Twomile Canyon, have led to potentially significant structural design issues, including the following (Kleinfelder 2010a):

- Potential for static deflection (compression)
- Potential for hydro-collapse, due to wetting

- Potential for excessive movement of buttress, due to dynamic slope instability
- Inadequate resistance to dynamic sliding forces
- Seismic shaking and building response

DOE has subsequently completed a draft slope stability analysis and determined that global slope stability is not an issue for the Deep Excavation Option (Flavin 2011).

As previously discussed, a 130-foot (40-meter) excavation would be required for the Modified CMRR-NF construction under the Deep Excavation Option. $Qbt3_L$, the poorly to nonwelded tuff, occurs from a depth of approximately 75 feet (23 meters) to approximately 125 to 130 feet (38 to 40 meters) below ground surface (Kleinfelder 2010b) (see Chapter 2, Figure 2–7). Therefore, under the Deep Excavation Option, $Qbt3_L$ would be excavated and replaced with concrete fill, as evaluated in the *Phase I Ground Modification Alternatives Feasibility Study, Chemistry and Metallurgy Research Replacement (CMRR) Nuclear Facility, Los Alamos National Laboratory* (Kleinfelder 2010a), and as detailed in the *Work Plan, Excavation Support Design, Chemistry and Metallurgy Research Facility Replacement (CMRR) Project, Los Alamos National Laboratory* (Kleinfelder 2010b). A 10-foot-thick (3-meter-thick) basemat and the Modified CMRR-NF foundation would be constructed directly upon this concrete fill material.

To meet the seismic protection design requirements resulting from the *Probabilistic Seismic Hazards Analysis* and other seismic studies (LANL 2005, 2007a, 2008a; Kleinfelder 2010a, 2010b), the Modified CMRR-NF would require additional structural concrete and reinforcing steel for construction of the walls, floors, and roof of the building, beyond what was estimated and analyzed in the 2003 *CMRR EIS* and included under the No Action Alternative for this SEIS. These portions of the Modified CMRR-NF would, accordingly, be thicker and heavier than was previously estimated. In addition, most of the worker access areas inside the building would be constructed with solid floors rather than steel grating floors; fire suppression water storage tanks would be located inside the Modified CMRR-NF rather than using existing exterior water storage tanks (the large size and weight of these tanks require additional building structural considerations); various utilities would be installed with added protection measures; and other seismic protection and safety measures would be incorporated into the building design and the installation of equipment.

All proposed new facilities would be designed, constructed, and operated in compliance with applicable DOE orders, requirements, and governing standards established to protect public and worker health and the environment. DOE Order 420.1B requires that nuclear or nonnuclear facilities be designed, constructed, and operated so that the public, the workers, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes. The order stipulates the natural phenomena hazards mitigation requirements for DOE facilities and specifically provides for re-evaluation and upgrade of existing DOE facilities when there is a significant degradation in the safety basis for the facility. DOE Standard 1020-2002 (DOE 2002a) implements DOE Order 420.1B and provides criteria for the design of new structures, systems, and components, as well as for evaluation, modification, or upgrade of existing structures, systems, and components, to ensure that DOE facilities can safely withstand the effects of natural phenomena hazards, such as earthquakes. See Section 4.3.10.2 for an evaluation of the potential radiological impacts of an earthquake.

Construction Impacts – Shallow Excavation Option

Ground Disturbance. Under the Shallow Excavation Option, additional land would be disturbed at TA-55 beyond that disturbed under the No Action Alternative. RLUOB has already been constructed adjacent to the Modified CMRR-NF site, and up to 30 feet (9 meters) of the 58-foot (18-meter) excavation required for the Shallow Excavation Option of the Modified CMRR-NF has already been completed as part of the geologic evaluation of the site. Excavation of the additional 28 feet (8.5 meters) would require the removal of approximately 236,000 cubic yards (180,000 cubic meters) of material. This material would be managed the same way as discussed under the Deep Excavation Option.

Aggregate Supply. Approximately 120,000 tons (110,000 metric tons) of coarse aggregate and 120,000 tons (110,000 metric tons) of fine aggregate (sand) would be required to support construction under this construction option. Sources of aggregate for concrete would be the same as discussed under the Deep Excavation Option.

Seismicity. As discussed under the Deep Excavation Option, a comprehensive update to the LANL seismic hazards analysis was completed in June 2007 (LANL 2007a). Based on this updated seismic hazard analysis, the geotechnical properties of the bedrock at the proposed Modified CMRR-NF location have been further evaluated with respect to the proposed Modified CMRR-NF structure and associated depth of excavation. Similar to the Deep Excavation Option, the Modified CMRR-NF excavation under the Shallow Excavation Option would be affected by the uppermost units of this geologic formation, consisting of Units 3 (Qbt3) and 4 (Qbt4) of the Tshirege Member of the Bandelier Tuff (see Chapter 2, Figure 2–8). In comparison to the units above and below, the lower part of Unit 3 ($Qbt3_L$) has lower bearing capacity, is more compressible, has higher porosity, and has less cohesion. These rock properties, coupled with its vertical proximity to the Modified CMRR-NF basemat and foundation grade (about 15 feet [4.6 meters] separate $Qbt3_L$ from the proposed foundation) and its lateral proximity to the slope of Twomile Canyon, have led to potentially significant basemat and structural design issues (Kleinfelder 2010a).

Under the Shallow Excavation Option, a 58-foot (18-meter) excavation would be required for the Modified CMRR-NF construction. $Qbt3_L$, the poorly to nonwelded tuff, occurs from a depth of approximately 75 feet (23 meters) to approximately 125 to 130 feet (38 to 40 meters) below ground surface (Kleinfelder 2010b) (see Chapter 2, Figure 2–8). Therefore, $Qbt3_L$ would remain in place under this construction option, with about 17 feet (5.2 meters) of vertical separation between $Qbt3_L$ and the 10-foot-thick (3-meter-thick) basemat and foundation. The new structures would be designed and constructed in accordance with geotechnical recommendations provided by the contractor engineering firm.

Operations Impacts—Modified CMRR-NF and RLUOB operations would not impact geologic and soil resources at LANL, as no ground disturbance would occur and no additional geologic resources would be required.

4.3.6 Surface-Water and Groundwater Quality

Water quality impacts are not expected to occur as a result of constructing and operating the Modified CMRR-NF at TA-55. Construction activities could lead to a short-term increase in stormwater runoff, erosion, and/or sedimentation, but potential impacts on surface-water quality would be mitigated through implementation of Stormwater Pollution Prevention Plans (SWPPPs) and their designated controls (best management practices). Groundwater quality impacts are not expected during construction or operations under this alternative.

4.3.6.1 Surface Water

There are no natural surface-water drainages in the vicinity of the proposed Modified CMRR-NF at TA-55, and no surface water would be used to support facility construction. During construction, it is expected that portable toilets would be used for construction personnel, resulting in no onsite discharge of sanitary wastewater and no impact on surface waters (DOE 2003a). However, plumbed restrooms made available to construction workers would generate sanitary effluent during the construction period; this effluent would be discharged to sanitary sewer lines for treatment at the Sanitary Wastewater Systems Plant in TA-46, and then piped to TA-3 and discharged to Sandia Canyon via a National Pollutant Discharge Elimination System (NPDES)-permitted outfall (DOE 2008a).

Construction Impacts – Deep Excavation Option—Stormwater runoff from construction activities under the Deep Excavation Option could potentially impact downstream surface-water resources, but would be minimized through stormwater control, implemented as part of an SWPPP, and therefore is not expected to adversely impact downstream surface-water resources. The SWPPP would be prepared, prior to commencement of construction, to implement requirements and guidance from Federal and state regulations under the Clean Water Act, including the NPDES Construction General Permit and Clean Water Act Section 401 and 404 permits. Stormwater management controls, including best management practices for increased stormwater flows and sediment loads, would be included in the construction design specifications (DOE 2008a). To monitor the effectiveness of erosion and sediment control measures, the SWPPP would include a mitigation monitoring program, such as consistent and continual inspection and maintenance, to ensure that an adequate schedule and procedures are in place and implemented.

TA-55 is not in an area that is prone to flooding, and the nearest 100-year floodplains are located at a distance of approximately 650 feet (200 meters) in Twomile Canyon, 1,900 feet (580 meters) in Mortandad Canyon, and 3,000 feet (910 meters) in Pajarito Canyon.

Construction activities associated with the Modified CMRR-NF and the Pajarito Road right-of-way realignment at TA-50 and TA-55 would not require a New Mexico Section 401 Water Quality Certification or U.S. Army Corps of Engineers 404 Dredge and Fill Permit. However, these construction activities would require an NPDES General Permit for Storm Water Discharge from Construction Activities and an associated SWPPP. If oil, gasoline, diesel fuel, or other petroleum products spill onto the ground, they must be cleaned up, containerized, characterized, and disposed of. Excess materials, such as product debris, equipment, chemicals, waste, concrete, asphalt, and stockpiled soil, are considered wastes and would not be abandoned at the end of the project (NNSA 2010a) (see Section 4.3.12 for discussion of construction waste generation and management). The shifted road segment would be closer to the edge of Twomile Canyon, but would remain on the mesa top and not enter the canyon (LANL 2010d). Potential impacts on surface-water quality due to construction for the Pajarito Road realignment would be minimized through implementation of the SWPPP to control soil erosion in accordance with the NPDES Construction General Permit.

Soil and rock material excavated from the Modified CMRR-NF location would be transported by truck to storage areas within LANL in accordance with routine material reuse practices at the site. Best management practices to control stormwater runoff and minimize erosion and/or sedimentation would be employed to protect surface waters. Management of construction fill is expected to have no effect on surface-water quality. An existing stormwater detention pond would be enlarged at TA-63, and an additional detention pond would be constructed to collect and control runout from the TA-46/63 construction laydown area spanning land across the shared boundary of both technical areas. Another detention pond would be constructed to collect and control runout from the TA-48/55 construction laydown area in TA-64. A smaller detention pond would be constructed in TA-50 to collect and control runoff from the Modified CMRR-NF construction site in TA-55 (LANL 2010d).

An SWPPP would be prepared and implemented for construction of a new, permanent 115-kilovolt electrical substation in TA-50. The new substation, located on approximately 1.4 acres (0.6 hectares), would include construction of a short, unpaved service access road from Pajarito Road to the substation (LANL 2010d). Construction of the 115-kilovolt electrical substation in TA-50 is not expected to negatively impact surface-water quality.

Construction Impacts – Shallow Excavation Option—Implementation of the Shallow Excavation Option is expected to result either in impacts similar to those under the Deep Excavation Option for surface-water quality during construction or reduced impacts because there would be less excavated soil under the Shallow Excavation Option that would need to be controlled for erosion and sedimentation. All of the same stormwater management controls identified under the Deep Excavation Option during construction would be utilized if the Shallow Excavation Option is implemented.

Operations Impacts—No impacts on surface-water quality are expected as a result of Modified CMRR-NF and RLUOB operations under this alternative, including operations at RLUOB. No surface water would be used to support the facility, and there would be no direct discharge of effluent to surface waters during facility operations (LANL 2010d).

The Modified CMRR-NF and RLUOB stormwater control system would be sized to collect and manage flow from both buildings and the surrounding area for up to a 25-year design storm. The system includes design features and best management practices that comply with sustainable design principles, as well as LANL and EPA standards. It would include roof drains, ditches, curbs and gutters, catch basins, manholes, storm sewer pipes, and a stormwater sediment basin or detention pond. The stormwater detention pond (located south of Pajarito Road in TA-50) would control erosion from stormwater runoff by detaining and releasing the storm flow in a controlled manner (LANL 2010d).

4.3.6.2 Groundwater

No impacts on groundwater are anticipated to result from construction and operation of the Modified CMRR-NF and RLUOB.

Construction Impacts – Deep Excavation Option—No onsite discharges that would affect groundwater are planned for construction of the Modified CMRR-NF. Appropriate spill prevention, countermeasures, and control procedures (for example, proper management of hazardous and nonhazardous wastes and materials such as diesel fuel or petroleum, oils, and lubricants from construction equipment) would be utilized to minimize potential releases that could affect groundwater.

Construction Impacts – Shallow Excavation Option—Implementation of the Shallow Excavation Option is expected to result in impacts similar to those under the Deep Excavation Option for groundwater quality during construction.

Operations Impacts—No impacts on groundwater resources (that is, groundwater quality or availability) are anticipated during operations of the Modified CMRR-NF or RLUOB under this alternative. No discharges to the surface or subsurface are planned, and spill prevention, countermeasures, and control procedures would be employed to minimize the probability of, and the potential for, an unplanned release that could infiltrate and affect groundwater (LANL 2010a). (The volume of groundwater required during construction and operations is discussed in Section 4.3.3)

4.3.7 Ecological Resources

4.3.7.1 Terrestrial Resources

Construction Impacts – Deep Excavation Option—Under the Deep Excavation Option, the affected areas within TA-5, TA-46, TA-48, TA-50, TA-52, TA-55, TA-63, and TA-64 are located on the mesa top and mostly within the ponderosa pine forest vegetation zone; however, areas within TA-36, TA-51, TA-54, and TA-72 are located on mesa tops or canyons at lower elevations to the east and fall within the pinyon-juniper woodland vegetation zone. About 6 acres (2.43 hectares) of undeveloped land, consisting mostly of ponderosa pine forest, would be permanently disturbed by vegetation removal and grading. About 95 acres (38.4 hectares) of undeveloped land, consisting of grasslands, ponderosa pine forest, and pinyon-juniper woodland, would be temporarily disturbed by vegetation removal and grading (see Table 4–14). Pajarito Road realignment, electrical substation, stormwater detention ponds, construction laydown areas, and concrete batch plants are within or adjacent to developed land or have been previously used for material storage and laydown activities (LANL 2010d). Vegetation and habitat would be most impacted by the parking lot located within TA-72; potential spoils storage areas within TA-51, TA-54, and TA-36; and a construction laydown and support area in TA-5/52. These areas are largely undeveloped and would remove mostly pinyon-juniper woodland. There are several areas of undeveloped land being considered for spoils storage, 30 acres (12.1 hectares) of which would be used on a long-term temporary basis under this construction option. Areas of temporary disturbance would be revegetated using native species following the construction period or, in the case of spoils storage areas, once they are no longer needed (LANL 2010c, 2011).

Where construction would occur on previously developed land, there would be little or no impact on terrestrial resources. Within areas of undeveloped ponderosa pine forest and pinyon-juniper woodland, construction would result in the loss of less-mobile wildlife, such as reptiles and small mammals, and displacement of more-mobile species, such as birds and large mammals. No impacts that would violate provisions of the Bald and Golden Eagle Protection Act or the Migratory Bird Treaty Act have been identified. The *Migratory Bird Best Management Practices Source Document for Los Alamos National Laboratory* provides site-wide mitigation measures, including timing of forest clearing to avoid the breeding season of migratory birds (June 1 through July 31), which would reduce risks to birds protected under the Migratory Bird Treaty Act at LANL (LANL 2010h). Indirect impacts of construction, such as noise or human disturbance, could also temporarily impact wildlife living adjacent to the construction zone. All work areas would be clearly marked to prevent construction equipment and workers from disturbing adjacent natural habitat.

Construction Impacts – Shallow Excavation Option—Potential impacts under the Shallow Excavation Option on terrestrial resources at LANL are similar to those expected under the Deep Excavation Option, with the exception that less land is required for spoils storage. Only about 10 acres (4 hectares) would be needed for spoils storage compared to 30 acres (12 hectares) under the Deep Excavation Option. The two potentially impacted areas would be 9.1 acres (3.7 hectares) of mostly undeveloped pinyon-juniper woodland within TA-51 and 19.1 acres (7.7 hectares) of mostly ponderosa pine forest within TA-5/52 along both sides of Puye Road. Spoils storage sites would potentially be established in either one or both of these areas. Potential impacts on terrestrial resources would be the same as discussed above under the Deep Excavation Option.

Operations Impacts—Operations at the Modified CMRR-NF and RLUOB would have a minimal impact on terrestrial resources within or adjacent to TA-55. Because wildlife residing in the area has already adjusted to levels of noise and human activity associated with current TA-55 operations, it is unlikely to be adversely affected by similar types of activity associated with Modified CMRR-NF and RLUOB operations (DOE 2003b).

4.3.7.2 Wetlands

Construction and Operations Impacts – Deep Excavation and Shallow Excavation Options—As noted in Chapter 3, Section 3.7.2, there is one wetland located within TA-55, four within TA-48, and nine within TA-36. Under the Modified CMRR-NF Alternative, no wetlands would be present in the areas where Modified CMRR-NF construction would occur, meaning there would be no direct impacts on wetlands. The wetlands within TA-48 and TA-55 are located in Mortandad Canyon, north of the project area, and would not be affected by construction. However, under the Deep Excavation Option, wetlands located in

TA-36 could be indirectly affected by possible spoils storage there, with the potential for stormwater runoff and erosion into the Pajarito watershed if TA-36 is selected for spoils storage. A sediment and erosion control plan would be implemented to control stormwater runoff during construction, preventing impacts on the wetlands located farther down Pajarito Canyon. Under the Shallow Excavation Option, there would be no direct or indirect impacts on any LANL wetlands because TA-36 would not be a potential spoils storage area. No impacts on wetlands are expected as a result of Modified CMRR-NF and RLUOB operations under this alternative.

4.3.7.3 Aquatic Resources

Construction and Operations Impacts – Deep Excavation and Shallow Excavation Options—The only aquatic resources present within the potentially impacted areas under the Modified CMRR-NF Alternative are small pools associated with the wetlands. There would be no direct impacts on these resources from the construction of most project elements associated with the Modified CMRR-NF. There could be indirect impacts on aquatic habitat within wetland areas located in TA-36 under the Deep Excavation Option, although, as stated above, a sediment and erosion control plan would be implemented to control stormwater runoff. No impacts on aquatic resources are expected as a result of Modified CMRR-NF and RLUOB operations under this alternative.

4.3.7.4 Threatened and Endangered Species

Construction Impacts – Deep Excavation Option—As noted in Chapter 3, Section 3.7.4, areas of environmental interest for the Mexican spotted owl and the southwestern willow flycatcher have been established at LANL to protect their potential habitat. Portions of TA-55 and other technical areas affected by construction under the Deep Excavation Option include both core and buffer zones for the federally threatened Mexican spotted owl (see **Table 4–25**). Project elements, including Pajarito Road realignment, electrical substation, stormwater detention ponds, construction laydown areas, and concrete batch plants, are within or adjacent to developed land or land that has been previously used for material storage and laydown activities. Therefore, potential habitat that would be removed for these project elements may affect, but is not likely to adversely affect the Mexican spotted owl. Other areas of concern that would impact undisturbed land include all potential spoils storage areas within TA-36, TA-51, and TA-54; a construction laydown and support area in TA-5/52; and a parking lot in TA-72 (see Section 4.3.2.1). Of these areas, the construction laydown and support area in TA-5/52 would fall within core and buffer zones of a Mexican spotted owl area of environmental interest and could impact up to 9.7 acres (3.9 hectares) and 12.9 acres (5.2 hectares) of potential habitat, respectively. Although a small portion of potential Mexican spotted owl habitat would be removed, no owls have been observed in those areas in annual surveys. A spoils storage area within TA-36 would be adjacent to the southwestern willow flycatcher area of environmental interest and would not remove any potential habitat for this species. However, due to possible erosion concerns affecting wetlands in that area, the potential habitat may be affected. No willow flycatchers of the southwestern species have been confirmed on LANL. As stated earlier, a sediment and erosion control plan would be implemented to control stormwater runoff. After biological evaluation, NNSA determined that construction may affect, but is not likely to adversely affect, the Mexican spotted owl or the southwestern willow flycatcher (LANL 2011). NNSA maintains an active process of consultation with the U.S. Fish and Wildlife Service in accordance with requirements of the Endangered Species Act. Consultations resulted in concurrence by U.S. Fish and Wildlife Service with NNSA's determination that construction and operation of the CMRR Facility in TA-55, including use of other areas for construction support activities, may affect, but is not likely to adversely affect, either individuals of threatened or endangered species currently listed by U.S. Fish and Wildlife Service, or their critical habitat at LANL (USFWS 2003, 2005, 2006, 2007, 2009). All project activities would be reviewed for compliance with the *Threatened and Endangered Species Habitat Management Plan* (LANL 2000a). Any lighting would be directed away from canyons and comply with the New Mexico Night Sky Protection Act, and disturbance and noise would be kept to a minimum (LANL 2010c).

Table 4–25 Modified CMRR-NF Alternative — Deep Excavation Option, Impacted Areas of Environmental Interest for the Mexican Spotted Owl

Project Element	*Technical Area*	*Mexican Spotted Owl Areas of Environmental Interest Impacted*	*Potential Impacts*
Pajarito Road realignment	55	Core and buffer	Some habitat would be developed. The National Nuclear Security Administration determined that construction may affect, but is not likely to adversely affect, the Mexican spotted owl due to removal of a small portion of potential habitat. No owls have been observed in the areas where project activity would occur under this alternative.
Electrical substation, stormwater detention ponds	50	Core and buffer	
	64	Slightly within buffer	
Construction laydown/concrete batch plant	46/63	Buffer and slightly within core	
	48/55	Buffer	
Construction laydown and support area	5/52	Core and buffer	
Spoils storage areas	5/52	Core and buffer	
	36	Buffer	
	51	Slightly within buffer	
	54	None	
Temporary power upgrades	55 through 50, 63, and 52 to 5	Core and buffer	
Parking lot and associated road improvements	72	None	

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
Source: LANL 2000a, 2011.

Construction Impacts – Shallow Excavation Option—Potential impacts on threatened and endangered species at LANL under the Shallow Excavation Option are similar to those under the Deep Excavation Option, with the exception that only about 10 acres (4 hectares) of spoils storage would be needed from two areas proposed for spoils storage (TA-51 and TA-5/52).

Operations Impacts— Modified CMRR-NF and RLUOB operations would not directly affect any endangered, threatened, or special status species within or adjacent to TA-55. Noise levels associated with the new facility would be low, and human disturbance would be similar to that which already occurs within TA-55. Nighttime lighting could indirectly affect prey species activities; however, any lighting would meet requirements under the New Mexico Night Sky Protection Act. These effects are not likely to adversely affect the Mexican spotted owl potential habitat areas.

4.3.8 Cultural and Paleontological Resources

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option encompasses numerous project elements that would involve both temporary and permanent facilities. These new facilities would have the potential to impact cultural resources within a number of the affected technical areas. **Table 4–26** lists the various project elements and the technical areas in which they would occur. Also presented are the total acreage involved, whether the action would be temporary or permanent, the number of NRHP-listed and -eligible sites within each technical area that could potentially be affected, and whether any eligible sites would be impacted.

Table 4–26 Modified CMRR-NF Alternative — Cultural Resources Impacts

Project Element	*Technical Area*	*Acreage*	*Status*	*NRHP-Listed and -Eligible Sites in Project Element Vicinity*	*Potential Conflict Between Project Element and NRHP-Listed and -Eligible Sites*
Pajarito Road realignment	55	3.4	P	One rock shelter	No effect through avoidance
Electrical substation	50	1.4	P	None	
Stormwater detention ponds	50	0.5	P	None	
	64	1	P	None	
Spoils storage areas					
	36	24.7	T	One 1- to 3-room structure	No effect through avoidance
	36	14.4	T	None	
	51	9.1	T	One cavate	No effect through avoidance
	54	18.6	T	Two 1- to 3-room structures; one complex pueblo; and one pueblo roomblock	No effect through avoidance
Parking lot and associated road improvements	72	13-15	T	Two lithic scatters and rock ring	No effect through avoidance. Northern third of Mortandad Trail would be impacted.
Temporary power upgrades	55 through 59 to 63	25.2	T	None	
	5/52	2	T	One 1- to 3-room structure in TA-5	No effect through avoidance
Construction laydown/concrete batch plant	46/63	40	T	Two 1- to 3-room structures in TA-46	No effect through avoidance
	48/55	20	T	One 1- to 3-room structure in TA-48	No effect through avoidance
Construction laydown and support area	5/52	19.1	T	One 1- to 3-room structure in TA-5; two cavates and one rock shelter in TA-52	No effect through avoidance

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; NRHP = National Register of Historic Places; P = permanent; T = temporary; TA = technical area.

Nine affected technical areas contain NRHP-listed or -eligible sites in the vicinity of project activities (see Table 4–26). In all cases, there would be no effect through avoidance. Under the procedures for compliance with *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico* (*Cultural Resources Management Plan*) (LANL 2006a), sites would be clearly marked and fenced, as appropriate, to avoid direct or indirect disturbance by construction equipment and workers. Further, construction activities would be monitored to ensure that the sites remain undisturbed. If buried cultural deposits are encountered during construction, activities would cease until their significance is determined and procedures are implemented in accordance with the *Cultural Resources Management Plan.* In addition, if project plans should change such that impacts become unavoidable, LANL would consult with the New Mexico State Historic Preservation Office in accordance with Section 106 of the National Historic Preservation Act of 1966 prior to any ground disturbance taking place.

In the case of TA-72, the northern third of the Mortandad Trail leading to the Mortandad Cave Kiva would be directly impacted or cut by construction of the parking lot. Access to this trail, and hence Mortandad Cave Kiva, is limited to organized tours. The project would work with LANL cultural resources personnel to re-establish the affected portion of the trail and thus maintain continued limited access to the Mortandad

Cave Kiva. However, to help control unauthorized visitation, the parking lot design would incorporate fencing around its perimeter to prevent direct access to the trail.

With respect to traditional cultural properties, it is anticipated that there would be no effect through avoidance. As is the case with other cultural resources, DOE would comply with Section 106 of the National Historic Preservation Act of 1966 should project plans change. Further, DOE would respect the needs of the pueblos during the construction period with regard to times when members might want to participate in ceremonies and rituals (see Chapter 3, Section 3.8.3). There are no known paleontological resources present at TA-55 at LANL. Thus, there would be no impacts on these resources.

Construction Impacts – Shallow Excavation Option—Construction of the Modified CMRR-NF under the Shallow Excavation Option would entail the same project elements noted above for the Deep Excavation Option. However, as only 10 acres (4 hectares) would be required for spoils storage, only TA-5/52 and TA-51 would be considered for this purpose. There are no NRHP-listed or -eligible sites within either of the areas proposed for spoils storage. Thus, there would be no impact on cultural resources from this element of the project.

Operations Impacts—Operation of the Modified CMRR-NF and RLUOB would not directly impact cultural or paleontological resources. Nevertheless, cultural resources would continue to be periodically monitored, and the fencing would be maintained, as appropriate, to ensure that they remain undisturbed. Impacts on the Mortandad Trail are described above.

4.3.9 Socioeconomics

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option would require a peak construction employment level of about 790 workers (LANL 2011). This level of employment would generate about 450 indirect jobs in the region around LANL. The potential total peak employment of 1,240 direct and indirect jobs represents an increase in the ROI workforce of approximately 0.8 percent. Direct construction employment would average 420 workers annually over this time, approximately half of the estimated peak employment. The average direct construction employment would result in about 240 indirect jobs in the region around LANL. This total of 660 direct and indirect jobs represents an approximate 0.4 percent increase in the ROI workforce. These small increases would have little or no noticeable impact on the socioeconomic conditions of the ROI.

Construction Impacts – Shallow Excavation Option—The impacts under the Shallow Excavation Option from construction of the Modified CMRR-NF would be similar to the Deep Excavation Option. The peak employment number of about 790 construction workers would be the same as under the Deep Excavation Option, and the annual average would be 410 workers over the life of the project. The average direct construction employment would result in about 240 indirect jobs in the region around LANL. This total of 650 direct and indirect jobs represents an approximate 0.4 percent increase in the ROI workforce. There would be little or no noticeable impact on the socioeconomic conditions of the ROI.

Operations Impacts—Operations at the Modified CMRR-NF and RLUOB would require a workforce of approximately 550 workers, including workers that would come from other locations at LANL to use the Modified CMRR-NF laboratory capabilities. The number of workers in support of Modified CMRR-NF operations would cause no change to socioeconomic conditions in the LANL four-county ROI. Workers assigned to the Modified CMRR-NF and RLUOB would be drawn from existing LANL facilities, including the CMR Building. The number of LANL employees supporting the Modified CMRR-NF and RLUOB operations would represent only a small fraction of the LANL workforce (approximately 13,500 in 2010) and an even smaller fraction of the regional workforce (approximately 165,000 in 2009).

4.3.10 Human Health Impacts

4.3.10.1 Normal Operations

No radiological risks would be incurred by members of the public from construction activities associated with the Modified CMRR-NF. Construction workers would be at a small risk for construction-related accidents and radiological exposures. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses are kept as low as is reasonably achievable.

Occupational injury and illness rates under the Modified CMRR-NF Alternative are projected to follow mostly the patterns observed at LANL sites from 1999 through 2008, as discussed in Chapter 3, Section 3.11, and documented in the *LANL SWEIS* (DOE 2008a). The average injury and illness rates at LANL during this period were 2.40 total recordable cases (TRCs) and 1.18 days away, restricted, or transferred (DART) cases (when workers missed days, their activities were restricted, or they were transferred due to an occupational injury or illness) for every 200,000 hours worked (see Section 3.11). Comparably, the average rates at DOE facilities are projected to result in 1.6 TRCs and 0.7 DART cases, based on the accident cases from 2004 through 2008 (DOE 2011a). Both of these sets of rates are well below industry averages, which in 2009 were 3.6 TRCs and 1.8 DART cases (BLS 2010a).

As stated in Chapter 3, Section 3.11.3, there have been no work-related accident fatalities at LANL for over 10 years. Review of the statistics on injury and illness data for DOE construction contractors from 2003 through March of 2010 identified no injuries resulting in death in over 160 million worker hours. Therefore, to estimate the potential for any fatalities during construction, the DOE-contractor average fatality rate of 0.0008 per 200,000 hours worked was used (DOE 2011a).

Construction Impacts – Deep Excavation Option—Under the Deep Excavation Option, construction of the Modified CMRR-NF would require a peak employment level of 790 workers and an average of 420 workers over the approximate 9-year construction period. Using this level of employment and the TRC and DART rates from LANL and DOE, there would be about 95 TRCs of occupational injury and illness and about 47 DART cases. During the same period, an estimated 0 (0.03) work-related fatalities would occur under the Deep Excavation Option from construction activities.

Construction Impacts – Shallow Excavation Option—Consistent with the Deep Excavation Option, construction of the Modified CMRR-NF under the Shallow Excavation Option would require a peak employment level of 790 workers, but an average of 410 workers over an approximate 9-year construction period. Using this level of employment and using the TRC and DART rates from LANL and DOE, there would be about 92 TRCs of occupational injury and illness and about 45 DART cases. During the same period, an estimated 0 (0.03) work-related fatalities would occur under the Shallow Excavation Option from construction activities.

Operations Impacts—Normal operations of the Modified CMRR-NF and RLUOB at TA-55 are not expected to result in an increase in LCFs among the general public. Under this alternative, the radiological releases to the atmosphere from the Modified CMRR-NF and RLUOB at TA-55 would be similar to those estimated in the *CMRR EIS* and provided in **Table 4–27**. The actinide emissions listed in this table are in the form of plutonium, uranium, thorium, and americium isotopes. In estimating the human health impacts, all actinide emissions were considered to be plutonium-239. This is conservative because the human health impacts on a per-curie basis are greater for plutonium-239 than for the other actinides associated with activities at the Modified CMRR-NF. Liquid radiological effluents would be routed through an existing pipeline to the TA-50 RLWTF, where they would be treated along with other LANL radioactive liquid wastes. The treatment residues would be solidified and disposed of as radioactive waste.

Table 4–27 Modified CMRR-NF Alternative — Modified CMRR-NF and RLUOB Radiological Emissions During Normal Operations

Nuclide	***Emissions (curies per year)***
Actinides	0.00076
Krypton-85	100
Xenon-131m	45
Xenon-133	1,500
Hydrogen-3 (tritium) [a]	1,000

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] The tritium release is in the form of both tritium oxide (750 curies) and elemental tritium (250 curies). Tritium oxide is more readily absorbed by the body and, therefore, the health impact of tritium oxide on a receptor is greater than that for elemental tritium. Therefore, all of the tritium release has been conservatively modeled as if it were tritium oxide.

Source: DOE 2003b.

Table 4–28 shows the annual collective dose to the population projected to be living within a 50-mile (80-kilometer) radius of TA-55 in 2030. The *CMRR EIS* provided estimates of annual collective doses to the general population and an MEI from radioactive releases during normal operations. Appendix B of the *CMRR EIS* documented the methodology and assumptions used in estimating the population and MEI doses. These doses were calculated using the GENII Version 1.485 computer program (Napier et al. 1988), which used dose conversion factors from Federal Guidance Report No. 11 and No. 12 (EPA 1988 and 1993a). The population dose in the *CMRR EIS* was based on the estimated population surrounding TA-55 in 2000. In this SEIS, the estimated population dose centered at TA-55 is based on the 2030 projected population estimate of about 545,000. In addition, in this SEIS, a revised version of the computer program, GENII Version 2 (PNNL 2007), was used, along with updated dose conversion factors. GENII Version 1.485 overestimated the projected dose by not depleting the radioactive cloud as particles settled during its travel downwind. GENII Version 2 does account for depletion, so even though a larger population was used in the current analysis, the new dose estimates are smaller than those provided in the *CMRR EIS* for the same released quantities of radioactive emissions. In addition, the use of revised dose conversion factors for inhalation from Federal Guidance Report No. 13, which are derived from models based on current understanding of the biological behavior of radionuclides in the body and models representing the U.S. population, resulted in lower estimated doses.

Doses were estimated for the general public living within 50 miles (80 kilometers) of the Modified CMRR-NF at TA-55, an average member of the public, and an offsite MEI (a hypothetical member of the public residing at the LANL site boundary who receives the maximum dose). The dose pathways for these receptors include inhalation, ingestion, and direct exposure from immersion in the passing plume and from materials deposited on the ground. To put the doses into perspective, they are compared to doses from natural background radiation[6] levels.

[6] *The term natural background radiation is used to mean the ubiquitous radiation in the environment that the population cannot avoid. It includes a small component of manmade radiation from past nuclear weapons testing.*

Table 4–28 Modified CMRR-NF Alternative — Annual Radiological Impacts of Modified CMRR-NF and RLUOB Operations on the Public

	Population Within 50 Miles (80 kilometers)	*Average Individual Within 50 Miles (80 kilometers)*	*Maximally Exposed Individual*
Dose	1.8 person-rem	0.0033 millirem	0.31 millirem
Cancer fatality risk [a]	1×10^{-3}	2×10^{-9}	2×10^{-7}
Regulatory dose limit [b]	Not applicable	10 millirem	10 millirem
Dose as a percentage of the regulatory limit	Not applicable	0.03	3.1
Dose from natural background radiation [c]	260,000 person-rem	480 millirem	480 millirem
Dose as a percentage of natural background dose	0.0007	0.0007	0.041

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Based on a risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

[b] 40 CFR Part 61, Subpart H, establishes an annual limit of 10 millirem via the air pathway to any member of the public from DOE operations. There is no standard for a population dose.

[c] The annual individual dose from background radiation at LANL is 480 millirem (see source of ubiquitous background radiation in Chapter 3, Section 3.11.1). The 2030 population living within 50 miles (80 kilometers) of TA-55 was estimated to be about 545,000.

Note: To convert miles to kilometers, multiply by 0.62137.

Table 4–28 shows the estimated population dose associated with Modified CMRR-NF operations to be 1.8 person-rem. This population dose would increase the annual risk of a latent fatal cancer in the population by 0.001. Another way of stating this is that the likelihood that one fatal cancer would occur in the population as a result of radiological releases associated with this alternative is about 1 chance in 1,000 per year. Statistically, LCFs are not expected to occur in the population from Modified CMRR-NF operations at TA-55.

The average annual dose to an individual in the population would be 0.0033 millirem under this alternative. The corresponding increased risk of an individual developing a latent fatal cancer from receiving the average dose would be 2×10^{-9}, or about 1 chance in 500 million per year.

The MEI would receive an estimated annual dose of 0.31 millirem. This dose corresponds to an increased annual risk of developing a latent fatal cancer of about 2×10^{-7}. In other words, the likelihood that the MEI would develop a fatal cancer is about 1 chance in 5 million for each year of operations.

Estimated annual doses to workers involved with Modified CMRR-NF and RLUOB operations under this alternative are provided in **Table 4–29**. The average annual worker dose for workers involved in Modified CMRR-NF and RLUOB activities was estimated to be about 140 millirem per radiation worker for Modified CMRR-NF activities and 20 millirem per radiation worker for RLUOB activities (LANL 2011). Therefore, a weighted average of about 109 millirem has been used as the estimate of the average annual worker dose per year of operations at the Modified CMRR-NF and RLUOB at TA-55.

The average annual worker dose of about 109 millirem is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). This average annual dose corresponds to an increased risk of a fatal cancer of 0.00007 for each year of operations. In other words, the likelihood that a worker at the Modified CMRR-NF would develop a fatal cancer from annual work-related exposure is about 1 chance in 14,000.

Table 4–29 Modified CMRR-NF Alternative — Annual Radiological Impacts of Modified CMRR-NF and RLUOB Operations on Workers

	Individual Worker	*Worker Population* [a]
RLUOB dose/fatal cancer risk [b]	20 millirem/1 × 10^{-5}	2.8 person-rem/2 × 10^{-3}
Modified CMRR-NF dose/fatal cancer risk [b, c]	140 millirem/8 × 10^{-5}	57.4 person-rem/3 × 10^{-2}
Total	Not applicable	60 person-rem/4 × 10^{-2}
Dose limit [d]	5,000 millirem	Not available
Administrative control level [e]	500 millirem	Not available

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Based on a radiation worker population of 140 for RLUOB and 410 for the Modified CMRR-NF at TA-55. Dose limits and administrative control levels do not exist for worker populations.

[b] Based on the average dose to LANL workers who received a measurable dose in the period from 2007 to 2009 and specific activities associated with the Modified CMRR-NF (LANL 2011). A program to reduce doses to as low as is reasonably achievable would be employed to reduce doses to the extent practicable.

[c] Based on a worker risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

[d] 10 CFR 835.202.

[e] DOE 1999b.

Based on a worker population of 550 combined in the Modified CMRR-NF and RLUOB, the estimated annual worker population dose would be 60 person-rem. This would increase the likelihood of a fatal cancer within the worker population by about 0.04 per year. In other words, on an annual basis, there is less than 1 chance in 25 of one fatal cancer developing in the entire worker population as a result of exposures associated with activities under this alternative.

Occupational injury and illness rates for normal operations under this alternative are projected to follow the patterns observed at LANL sites from 1999 through 2008, as discussed in Chapter 3, Section 3.11.3. Using the average TRC and DART case rates at LANL of 2.4 and 1.18 for every 200,000 hours worked, respectively, it is expected that the workers would experience about 14 TRCs and about 7 DART cases, annually.

Hazardous Chemicals Impacts

No chemical-related health impacts on the public would be associated with the Modified CMRR-NF and RLUOB operations. As stated in the 2008 *LANL SWEIS*, the laboratory quantities of chemicals that could be released to the atmosphere during normal operations are minor quantities and would be below the screening levels used to determine the need for additional analysis. Workers would be protected from adverse effects from the use of hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals.

4.3.10.2 Facility Accidents

The Modified CMRR-NF would include safety features that would reduce the risks of accidents described under the No Action Alternative (2004 CMRR-NF). From an accident perspective, the proposed Modified CMRR-NF built under either construction option would be designed to meet the Performance Category 3 seismic requirements and would have a full confinement system that includes tiered pressure zone ventilation and HEPA filters.

Radiological Impacts

Appendix C of this SEIS provides the methodology and assumptions used in developing facility accident scenarios and estimating doses to the general public within 50 miles (80 kilometers), the offsite MEI, and an onsite worker near the facility. Two of the four accidents analyzed for the 2004 CMRR-NF, as described in Section 4.2.10.2, were modified to account for the design changes needed to ensure the Modified CMRR-NF would survive a design-basis earthquake (see Appendix C). The revised seismic accidents would result in lower released quantities of radioactive material because the Modified CMRR-NF would be designed to survive a design-basis earthquake accident; thus, releases from the Modified CMRR-NF due to such an earthquake would be mitigated, whereas the 2004 CMRR-NF would likely fail in the event of such an earthquake. The Modified CMRR-NF would be a much stronger and seismically resistant structure compared to the 2004 CMRR-NF.

Tables 4–30 and **4–31** provide the accident consequences and risks for the Modified CMRR-NF. Table 4–30 presents the frequencies and consequences of the postulated set of accidents for a noninvolved worker at the technical area boundary, a distance of 240 yards (220 meters), the offsite MEI at the nearest public location (0.75 miles [1.2 kilometers] north-northeast of TA-55), and the general population living within 50 miles (80 kilometers) of the facility. Table 4–31 presents the accident risks, obtained by multiplying each accident's consequences by the likelihood (frequency per year) that the accident would occur.

Table 4–30 Modified CMRR-NF Alternative — Accident Frequency and Consequences

		Maximally Exposed Individual		*Offsite Population* [a]		*Noninvolved Worker at TA Boundary*	
Accident	*Frequency (per year)*	*Dose (rem)*	*Latent Cancer Fatality* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatality* [b]
Safety-Basis Scenarios							
Facility-wide fire	0.0001	1.1	0.0007	720	0 (0.4)	5.9	0.004
Seismically induced spill with mitigation	0.0001	1.5	0.0009	350	0 (0.2)	51	0.06
Seismically induced fire with mitigation	0.0001	0.6	0.0004	480	0 (0.3)	3.4	0.002
Loading-dock spill/fire	0.01	0.028	0.00002	6.4	0 (0.004)	1.0	0.0006
SEIS Scenarios							
Facility-wide fire	0.000001	0.011	0.000007	7.2	0 (0.004)	0.059	0.00004
Seismically induced spill with mitigation	0.0001	0.3	0.0002	69	0 (0.04)	10	0.006
Seismically induced fire with mitigation	0.00001	1.0	0.0006	770	0 (0.5)	5.5	0.003
Loading-dock spill/fire	0.0001	0.028	0.00002	6.4	0 (0.004)	1.0	0.0006

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; SEIS = supplemental environmental impact statement; TA = technical area.

[a] Based on a projected 2030 population estimate of about 545,000 persons residing within 50 miles (80 kilometers) of TA-55.

[b] Increased likelihood of an LCF for an individual if the accident occurs.

[c] Increased number of LCFs for the offsite population if the accident occurs (results rounded to 1 significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.

Table 4–31 Modified CMRR-NF Alternative —Annual Accident Risks

Accident	*Risk of Latent Cancer Fatality*		
	Maximally Exposed Individual [a]	*Offsite Population* [b, c]	*Noninvolved Worker at TA Boundary* [a]
Safety-Basis Scenarios			
Facility-wide fire	7×10^{-8}	4×10^{-5}	4×10^{-7}
Seismically induced spill with mitigation	9×10^{-8}	2×10^{-5}	6×10^{-6}
Seismically induced fire with mitigation	4×10^{-8}	3×10^{-5}	2×10^{-7}
Loading-dock spill/fire	2×10^{-7}	4×10^{-5}	6×10^{-6}
SEIS Scenarios			
Facility-wide fire	7×10^{-12}	4×10^{-9}	4×10^{-11}
Seismically induced spill with mitigation	2×10^{-8}	4×10^{-6}	6×10^{-7}
Seismically induced fire with mitigation	6×10^{-9}	5×10^{-6}	3×10^{-8}
Loading-dock spill/fire	2×10^{-9}	4×10^{-7}	6×10^{-8}

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; SEIS = supplemental environmental impact statement; TA = technical area.

[a] Increased risk of an LCF to the individual.

[b] Increased risk of an LCF in the offsite population.

[c] Based on a projected 2030 population estimate of about 545,000 persons residing within 50 miles (80 kilometers) of TA-55.

The accident with the highest potential risk to the MEI (see Table 4–31) would be a loading-dock spill/fire caused by mishandling material or an equipment failure (safety-basis scenario). This accident would present an annual risk of an LCF to the offsite MEI of 2×10^{-7}. In other words, the offsite MEI's likelihood of developing a latent fatal cancer from this event is about 1 chance in 5,000,000 per year. The accident with the highest potential risk to the offsite population would be a facility-wide fire or the loading-dock spill/fire (safety-basis scenario). These accidents would present increased risks of a single LCF in the entire population by 4×10^{-5} per year; in other words, the likelihood of one fatal cancer in the entire population from either of these events would be about 1 chance in 25,000 per year. Statistically, LCFs would not be expected to occur in the population. The maximum risk of an LCF to a noninvolved worker would be from a seismically induced spill or the loading-dock spill/fire (safety-basis scenario); the risk would be 6×10^{-6}, or about 1 chance in 160,000 per year.

Involved Worker Impacts

Approximately 550 workers would be at the Modified CMRR-NF and RLUOB during operations. Workers near an accident could be at risk of serious injury or death. Following initiation of accident and site emergency alarms, workers in adjacent areas of the facility would evacuate the area in accordance with technical area and facility emergency operating procedures and training.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals that would be used in the Modified CMRR-NF and RLUOB operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used would be well below threshold quantities set by the EPA (40 CFR Part 68) and would pose minimal potential hazards to the public health and the environment in an accident condition. These chemicals would be stored and handled in small quantities (10 to a few hundred milliliters) and would only be a hazard to the involved worker under accident conditions.

4.3.10.3 Intentional Destructive Acts

Analysis of the impacts of terrorist incidents on the construction and operation of the Modified CMRR-NF is presented in a classified appendix to this SEIS. The impacts of some terrorist incidents would be similar to the accident impacts described earlier in this section, while some terrorist incidents may have more-severe impacts. A description of how NNSA assesses the vulnerability of its sites to terrorist threats and then designs its response systems is in Section 4.2.10.3.

4.3.11 Environmental Justice

Construction Impacts – Deep Excavation and Shallow Excavation Options—There would be no disproportionately high and adverse environmental impacts on minority or low-income populations due to construction activities at TA-55 under either construction option of the Modified CMRR-NF Alternative. This conclusion is a result of analyses in this *CMRR-NF SEIS* that determined there would be no significant impacts on human health, ecological resources, cultural and paleontological resources, socioeconomics, or other resource areas described in other subsections of this chapter.

Operations Impacts—Population estimates of the entire population and minority and low-income subsets of the population have been projected to the year 2030 (see Section 4.3.10.1 and Chapter 3, Section 3.10). As shown in **Table 4–32**, the total population within 50 miles (80 kilometers) of TA-55 under the Modified CMRR-NF Alternative is projected to receive an annual dose of approximately 1.8 person-rem and an average annual individual dose of 0.0033 millirem.

The population subset of nonminority individuals would receive the highest average dose, 0.0035 millirem, annually. This dose is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 2×10^{-9}, or 1 chance in about 500 million, annually. Doses were also estimated for the following population subsets: all (total) minorities, Native Americans, and Hispanics of any race. The total minority population is expected to receive the largest annual collective dose (1.0 person-rem) because the majority of the population surrounding LANL is considered part of a minority group and an annual average individual dose of 0.0032 millirem. Native Americans living within 50 miles (80 kilometers) of TA-55 would receive a collective dose of 0.09 person-rem annually and an average annual individual dose of 0.0029 millirem. The Hispanic population would receive a collective dose of 0.77 person-rem annually; the average annual individual dose to a member of the Hispanic population would be 0.0031 millirem. These data show that the dose to all population subsets surrounding TA-55 would be small and would not result in adverse impacts on human health. Although the annual population dose to the total minority population is projected to be slightly higher than that to the nonminority population, the difference between doses is not appreciable. Furthermore, the dose to the average individual of the nonminority population is projected to be slightly higher than the projected dose to the average individual in the minority population.

Population doses to persons living below the poverty level are also analyzed in Table 4–32. Low-income populations surrounding TA-55 would receive an annual dose of 0.20 person-rem and an annual average individual dose of 0.0031 millirem. Persons living above the poverty level would receive an annual collective dose of 1.6 person-rem and an annual average individual dose of 0.0034 millirem.

For nonradiological air quality impacts, as shown in Table 4–4, the concentrations of criteria pollutants as a result of Modified CMRR-NF and RLUOB operations under the Modified CMRR-NF Alternative would remain well below the ambient standards established to protect human health. Therefore, the impact of potential nonradiological air pollutant releases on minority or low-income individuals under this alternative would not be considered significant.

Table 4–32 Modified CMRR-NF Alternative — Comparison of Doses to Total Minority, Hispanic, Native American, and Low-Income Populations Within 50 Miles (80 kilometers) and to Average Individuals

	Annual Population Dose (person-rem)	*Annual Individual Dose (millirem)*
Total population	1.8	
Average individual		0.0033
White (non-Hispanic) population	0.81	
Nonminority average individual		0.0035
Total minority population	1.0	
Minority average individual		0.0032
Hispanic population [a]	0.77	
Hispanic average individual		0.0031
Native American population [b]	0.09	
Native American average individual		0.0029
Non-low-income population	1.6	
Non-low-income average individual		0.0034
Low-income population	0.20	
Low-income average individual		0.0031

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] The Hispanic population includes all Hispanic persons regardless of race.
[b] The Native American population may include persons who also indicated that they were of Hispanic ethnicity.

Residents of the Pueblo of San Ildefonso have expressed concern that pollution from CMRR Facility operations could contaminate Mortandad Canyon, which drains onto pueblo land and sacred areas. CMRR Facility operations under this alternative are not expected to adversely affect air or water quality or result in contamination of tribal lands adjacent to the LANL boundary.

These data show that the total minority, Native American, Hispanic, and low-income populations would not be subjected to disproportionately high and adverse impacts from normal operations of the Modified CMRR-NF and RLUOB at TA-55.

4.3.12 Waste Management and Pollution Prevention

Construction Impacts – Deep Excavation and Shallow Excavation Options—Under either construction option, acreage would be disturbed in several technical areas in addition to TA-55. Surveys have been conducted to identify potential release sites (PRSs), and no unidentified or unexpected soil contamination or buried media have been encountered (LANL 2010c). There are, however, known PRSs located within the affected technical areas (for example, Material Disposal Area [MDA] C in TA-50), and the potential for contact with contaminated soil or other media would be appropriately considered throughout the construction process. For example, PRS-48-001 is being evaluated for potential impacts resulting from actions in the TA-48/55 laydown and concrete batch plant area. Proper precautions would be taken as needed to minimize the potential disturbance of this or other PRSs. As needed, actions such as appropriate documentation and contaminant removal would be taken by the LANL Environmental Restoration Program in accordance with the 2005 Consent Order[7] and other applicable requirements. Wastes that might be generated from these actions have not been specifically analyzed because the types and quantities

[7] *In March 2005, the New Mexico Environment Department, DOE, and the LANL management and operating contractor entered into a Compliance Order on Consent (Consent Order) (NMED 2005). The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, LANL; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, LANL; and (3) to implement such corrective measures.*

of waste are unknown. Possible waste volumes that could result from site-wide remediation activities were, however, projected in the 2008 *LANL SWEIS* (see Chapter 3, Section 3.12).

Modified CMRR-NF construction would principally generate nonhazardous solid waste under either the Deep or Shallow Excavation Option. If small quantities of other radioactive or nonradioactive wastes are generated, as experienced during RLUOB construction, the wastes would be managed in accordance with standard LANL procedures (see Chapter 3, Section 3.12). Sanitary wastewater generated as a result of construction activities would be managed using some plumbed restrooms and portable toilet systems, with sanitary wastewater from the restrooms transferred to the Sanitary Wastewater Systems Plant in TA-46 for treatment. No other nonhazardous liquid wastes are expected.

Total and peak annual quantities of construction waste (construction debris and sanitary solid waste generated by construction workers) were estimated for both construction options and are summarized in **Table 4–33**. Under the Modified CMRR-NF Alternative, regardless of the excavation option, the same peak annual waste quantities would be generated and the same total quantity of construction waste (2,600 tons [2,400 metric tons]) would be generated since the difference is due to excavation and other activities during which little construction waste would be generated. Using an average waste density of 0.5 tons per cubic yard, 340 tons (308 metric tons) of peak annual waste would represent about 1 percent of the 59,000 to 62,000 cubic yards (45,000 to 47,000 cubic meters) of construction and demolition waste annually projected in the 2008 *LANL SWEIS* (see Table 4–55).

Table 4–33 Modified CMRR-NF Alternative — Construction Debris and Sanitary Solid Waste Generation for Construction of the Modified CMRR-NF

Construction Option	***Construction Waste (tons)*** [a]	
	Total	***Peak Annual***
Deep Excavation	2,600	340
Shallow Excavation	2,600	340

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] Construction waste includes construction debris and sanitary solid waste generated by construction workers.
Note: Estimates have been rounded. To convert tons to metric tons, multiply by 0.90718.

The waste would be collected in appropriate waste containers such as dumpsters or rolloffs and regularly disposed of or recycled by transfer to the Los Alamos County Eco Station located at the Los Alamos County Landfill site within the LANL boundary or by transfer to an offsite solid waste facility permitted to accept the waste. Waste transferred to the Los Alamos County Eco Station would be separated into materials suitable for recycle or disposal, and both types of materials would be shipped for offsite disposition. Because the Los Alamos County Eco Station is permitted to accept construction and demolition waste, as well as municipal solid waste, it is expected that the Los Alamos County Eco Station would be able to accept the bulk of the projected waste from the Modified CMRR-NF construction. If waste is generated that is not acceptable at the Los Alamos County Eco Station (for example, petroleum-contaminated soil or other special waste), or for other reasons such as convenience to the government, then the waste would be transferred to an appropriate, permitted offsite facility for disposition.

No impacts on available solid waste management capacity are expected because of the small quantity of waste to be managed annually (340 tons [308 metric tons] of combined construction debris and sanitary solid waste) compared to the total quantities of solid waste addressed on a county and state basis and the large number of available waste disposition facilities within New Mexico. Including the Los Alamos County Eco Stations, 239 landfills, recycling facilities, composting facilities, or transfer stations of convenience were permitted in New Mexico as of July 2009, including 19 facilities permitted to accept special waste, such as petroleum-contaminated soil (NMED 2009). The projected annual quantity of Modified CMRR-NF construction debris and sanitary solid waste represents only about 1 percent of the waste processed in 2009 at the Los Alamos County Eco Station.

Operations Impacts—Projected annual waste generation rates for operations at the Modified CMRR-NF and RLUOB are summarized in **Table 4–34** (LANL 2010c), along with projected overall LANL activities based on information from the 2008 *LANL SWEIS* (DOE 2008a; LANL 2010a). In the following discussion, waste generation rates projected in this *CMRR-NF SEIS* from operation of the Modified CMRR-NF and RLUOB are compared to waste generation rates projected in the 2008 *LANL SWEIS* from operation of the CMR Building and site-wide LANL operations. Radioactive solid and liquid wastes generated from Modified CMRR-NF and RLUOB operations would constitute only fractions of the total quantities of each of these generated wastes (see Table 4–34).

Note that a transition period would initially occur, during which operations at the CMR Building would be transferred to the Modified CMRR-NF. During this transition period, wastes would be generated at both the CMR Building (see Section 4.4.12) and the Modified CMRR-NF and RLUOB, although the annual rates may be less at either facility than the rates estimated in Table 4–34 and in Section 4.4.12.[8] Both on- and offsite waste management capacity are sufficient for this transition period.

Transuranic and Mixed Transuranic Wastes

Activities at the Modified CMRR-NF would generate transuranic and mixed transuranic wastes that would be packaged in containers in accordance with the WIPP acceptance criteria and shipped to WIPP for disposal. The combined annual volume of transuranic and mixed transuranic wastes (88 cubic yards [67 cubic meters]) is about 60 percent larger than that projected for the CMR Building operations in the 2008 *LANL SWEIS* (DOE 2008a). It would represent only about 10 to 20 percent of the annual 440 to 870 cubic yards (340 to 670 cubic meters) of combined transuranic and mixed transuranic waste projected for site-wide LANL operations in the 2008 *LANL SWEIS*. The Modified CMRR-NF would be designed and operated to accommodate the projected waste volumes, and no difficulty in managing the waste for shipment to WIPP is expected on either a facility or a site-wide LANL basis.

Over 50 years of Modified CMRR-NF and RLUOB operations (DOE 2003b), about 4,400 cubic yards (3,400 cubic meters) of transuranic and mixed transuranic wastes would be generated. The total WIPP capacity for transuranic waste disposal is set at 219,000 cubic yards (168,000 cubic meters) of contact-handled transuranic waste pursuant to the Waste Isolation Pilot Plant Land Withdrawal Act (DOE 2002b). Estimates in the *Annual Transuranic Waste Inventory Report – 2010* (DOE 2010b) indicate that about 185,000 cubic yards (141,000 cubic meters) of contact-handled transuranic waste would be disposed of at WIPP, about 36,000 cubic yards (27,500 cubic meters) less than the contact-handled transuranic waste permitted capacity. The projected 50-year total of 4,400 cubic yards (3,400 cubic meters) of transuranic and mixed transuranic waste from Modified CMRR-NF and RLUOB operations would require about 12 percent of the unsubscribed WIPP disposal capacity.

Note that disposal operations at WIPP are currently approved through 2034, based on its operations permit; however, WIPP may meet its statutory disposal limit before the end of the operational period of the Modified CMRR-NF. If necessary, transuranic or mixed transuranic waste generated without a disposal pathway would be safely stored pending development of additional disposal capacity.

[8] *Operations at the Modified CMRR-NF and RLUOB would be limited initially and then increase at the same time that CMR Building operational activities would decrease.*

Table 4–34 Modified CMRR-NF Alternative — Operational Waste Generation Rates Projected for Modified CMRR-NF, RLUOB, and Los Alamos National Laboratory Activities

Waste Type	*Projected Modified CMRR-NF Generation Rate* [a]	*Projected RLUOB Generation Rate* [a]	*Projected Modified CMRR-NF and RLUOB Generation Rate*	*Site-wide LANL Projections*
Transuranic and mixed transuranic (cubic yards per year)	88	0	88	440 to 870 [b]
Low-level radioactive (cubic yards per year)	2,510	130	2,640	21,000 to 115,000 [b]
Mixed low-level radioactive (cubic yards per year)	23.7	2.3	26	320 to 18,100 [b]
Chemical (tons per year) [c]	11.9	0.5	12.4	3,200 to 5,750 [b]
Sanitary solid (tons per year) [d]	71	24	95	– [e]
Sanitary wastewater (gallons per year)	8,315,000	2,485,000	10,800,000	156,000,000 [f]
Radioactive liquid (gallons per year)	248,000 [g]	95,800	344,000	4,000,000 [h]

CMRR-NF = Chemistry and Metallurgy Research Replacement Project Nuclear Facility; LANL = Los Alamos National Laboratory; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] From *CMRR-NF Project and Environmental Description Document* (LANL 2010d) and other sources (LANL 2011).

[b] Projected waste quantities from LANL operations are given as a range in the *LANL SWEIS* (DOE 2008a). The listed value reflects the assumption of the Expanded Operations Alternative in the *LANL SWEIS*, less the waste projected from some activities that were not implemented (see Table 4-55).

[c] Chemical waste is not a formal waste LANL category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this SEIS to denote a variety of materials, including hazardous waste regulated under the Resource Conservation and Recovery Act; toxic waste regulated under the Toxic Substances Control Act; and special waste designated under the New Mexico Solid Waste Regulations, including industrial waste, infectious waste, and petroleum-contaminated soil.

[d] The projected quantity of Modified CMRR-NF and RLUOB sanitary solid waste (municipal trash) was estimated by multiplying the projected annual number of full-time equivalent radiation workers (140 for RLUOB and 410 for Modified CMRR-NF) by an assumed annual 344 pounds of waste generated per person per year (see Chapter 3, Section 3.12.2).

[e] Annual sanitary solid waste quantities were not projected in the 2008 *LANL SWEIS*.

[f] The value shown is the annual volume of wastewater processed at the Sanitary Wastewater Systems Plant in TA-46, assuming operation at its 600,000-gallon-per-day design capacity for 260 working days per year (DOE 2003b). Sanitary wastewater and nonradioactive liquid waste are both projected to be routed to the Sanitary Wastewater Systems Plant for treatment.

[g] Includes 247,000 gallons per year of liquid low-level radioactive waste and 950 gallons per year of liquid transuranic waste at the Modified CMRR-NF (Balkey 2011).

[h] The value shown is the projected annual liquid low-level radioactive waste treatment rate at RLWTF assuming implementation of the No Action Alternative in the 2008 *LANL SWEIS*; annual treatment of 30,000 gallons of liquid transuranic waste was also projected (DOE 2008a).

Note: To convert cubic yards to cubic meters, multiply by 0.76456; tons to metric tons, by 0.90718; gallons to liters, by 3.78533.

Low-Level Radioactive Waste

Solid low-level radioactive waste generated from Modified CMRR-NF and RLUOB operations would be characterized and packaged for disposal. Disposal would occur off site at the Nevada National Security Site (NNSS) (formerly known as the Nevada Test Site) or at a commercial disposal facility or could occur on site while Area G continues to accept waste. Typical disposal containers would include B-25 boxes and 55-gallon (208-liter) drums. About 2,640 cubic yards (2,020 cubic meters) of solid low-level radioactive waste would be generated annually, including the solid low-level radioactive component of liquid wastes treated through RLWTF or a similar facility. This projected volume would represent a 10 percent increase in the low-level radioactive waste annually projected for the CMR Building in the 2008 *LANL SWEIS* (DOE 2008a). The projected waste from Modified CMRR-NF and RLUOB operations would represent about 2 to 13 percent of the projected annual site-wide LANL volume (21,000 to 115,000 cubic yards [16,000 to 88,000 cubic meters]).

Because the Modified CMRR-NF and RLUOB would be designed, constructed, and operated to accommodate the projected waste volumes for the facilities, no difficulties are expected in packaging and staging this waste pending transfer to LANL Area G or shipment to offsite disposal facilities. Disposal capacity is also expected to be available. Annual generation of 2,640 cubic yards (2,020 cubic meters) of low-level radioactive waste from the Modified CMRR-NF and RLUOB operations would represent about 4 percent of the average low-level radioactive waste disposal rate at the NNSS[9] and about 2 percent of the current low-level radioactive waste disposal rate at the commercial facility in Clive, Utah.[10]

Mixed Low-Level Radioactive Waste

Mixed low-level radioactive waste generated from Modified CMRR-NF and RLUOB operations would be packaged and temporarily stored pending transport off site to a commercial treatment, storage, and disposal facility and/or to the NNSS in Nevada. Typical shipment packages would include B-25 boxes and 55-gallon (208-liter) drums. The projected 26 cubic yards (20 cubic meters) of mixed low-level radioactive waste from Modified CMRR-NF operations would be only slightly larger than the annual rate projected from the CMR Building in the 2008 *LANL SWEIS* (DOE 2008a). The projected Modified CMRR-NF and RLUOB volume would represent about 0.1 to 8 percent of the 320 to 18,100 cubic yards (240 to 14,000 cubic meters) of mixed low-level radioactive waste projected for LANL in the 2008 *LANL SWEIS*.

Sufficient offsite treatment, storage, and disposal capacity is expected for the mixed low-level radioactive waste projected from Modified CMRR-NF and RLUOB operations. Several permitted commercial treatment, storage, and disposal facilities exist in the United States (for example, in Florida, Tennessee, Texas, Washington, and Utah), in addition to the mixed low-level radioactive waste disposal capacity available at the NNSS in Nevada, and additional facilities may be used as they are available and appropriate for the waste contents or characteristics. The projected mixed low-level radioactive waste from the Modified CMRR-NF and RLUOB would represent about 2 percent of the average mixed low-level radioactive waste disposal rate at the NNSS[11] and less than 1 percent of the current mixed low-level radioactive waste disposal rate at the commercial facility in Clive, Utah.[12]

Chemical Waste

Chemical waste is not a formal LANL waste category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this *CMRR-NF SEIS* to denote a broad category of materials, including hazardous wastes, toxic wastes, and special waste designated under the New Mexico Solid Waste Regulations. Chemical waste generated from Modified CMRR-NF and RLUOB operations would be packaged and shipped to offsite permitted recycle or treatment, storage, and disposal facilities, typically in 55-gallon drums. Temporary storage before offsite shipment may occur at the Modified CMRR-NF and RLUOB or at a permitted LANL storage area. About 12.4 tons (11.2 metric tons) of chemical waste would be generated annually from Modified CMRR-NF and RLUOB operations. This projected rate is only slightly larger than the chemical waste projected for the CMR Building in the 2008 *LANL SWEIS* (DOE 2008a). The projected Modified CMRR-NF and RLUOB operations chemical waste quantity would

[9] *For the 5 years from 2004 through 2008, an annual average of 62,903 cubic yards of LLW and 1,541 cubic yards of mixed low-level radioactive waste was disposed of at NNSS (Gordon 2009).*
[10] *Based on estimates for three-quarters of calendar year 2010, extrapolated to 1 year (Hultquist 2010).*
[11] *For the 5 years from 2004 through 2008, an annual average of 62,903 cubic yards of LLW and 1,541 cubic yards of mixed low-level radioactive waste was disposed of at NNSS (Gordon 2009).*
[12] *Based on estimates for three-quarters of calendar year 2010, extrapolated to 1 year (Hultquist 2010).*

represent from 0.2 to 0.4 percent of the annual chemical waste projection for LANL in the 2008 *LANL SWEIS*. The Modified CMRR-NF and RLUOB would be designed and operated to accommodate this waste, and no difficulty in managing this waste for shipment for offsite disposition is expected on either a facility or a site-wide LANL basis. Adequate offsite waste disposition capacity is expected for the chemical waste projected from Modified CMRR-NF and RLUOB operations because of the large number of permitted facilities that exist within New Mexico and neighboring states.

Sanitary Solid Waste

Based on the projected number of full-time equivalent workers at the Modified CMRR-NF and RLUOB (550) and the assumption that each worker generates 344 pounds (156 kilograms) of sanitary solid waste (municipal trash) annually (see Chapter 3, Section 3.12.2), about 95 tons (86 metric tons) of sanitary solid waste would be generated annually. This waste would be collected in appropriate waste containers, such as dumpsters, and regularly disposed of or recycled by transfer to the Los Alamos County Eco Station located at the Los Alamos County Landfill site within the LANL boundary or by transfer to an offsite solid waste facility permitted to accept the waste. No impacts on available solid waste management capacity are expected because of the small quantity of sanitary solid waste that would be generated at the Modified CMRR-NF and RLUOB compared to the total quantities of solid waste addressed annually on a county and state basis and the large number of available waste disposition facilities within New Mexico. Ninety-five tons (86 metric tons) of sanitary solid waste generation would represent only about 0.3 percent of the waste processed in 2009 at the Los Alamos County Eco Station (see the *Construction Impacts* discussion within this section).

Sanitary Wastewater

Approximately 10,800,000 gallons (40,900,000 liters) of sanitary wastewater would be generated annually from Modified CMRR-NF and RLUOB operations; this wastewater would to be sent to the Sanitary Wastewater Systems Plant in TA-46 (see Chapter 3, Section 3.12.1). The projected wastewater volume from the Modified CMRR-NF and RLUOB would include 7,300,000 gallons (27,600,000 liters) for sanitary flow and 3,500,000 gallons (13,200,000 liters) for reject water from the facility demineralization water treatment system.[13] This wastewater flow would represent only about 7 percent of the 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity of the Sanitary Wastewater Systems Plant in TA-46, assuming 260 working days per year (DOE 2003b). Therefore, no impacts on available sanitary wastewater treatment capacity are expected from Modified CMRR-NF and RLUOB operations.

Radioactive Liquid Waste

Modified CMRR-NF and RLUOB operations are projected to generate about 344,000 gallons (1.3 million liters) of liquid low-level radioactive waste annually, including about 950 gallons (3,600 liters) of liquid transuranic waste. This liquid waste would be transferred for treatment to RLWTF in TA-50 (Balkey 2011). The treatment process would generate solid low-level radioactive waste (for example, solidified liquids) that would be managed as discussed above. The annual volume of radioactive liquid waste from the Modified CMRR-NF and RLUOB would represent only about 8.5 percent of the annual volume of 4 million gallons (15 million liters) of liquid low-level radioactive waste and 3 percent of the 30,000 gallons (110,000 liters) of liquid transuranic waste projected for RLWTF in the 2008 *LANL SWEIS* (see Table 4–34). The projected liquid waste generation rates from Modified CMRR-NF and RLUOB

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[13] *All water supplied to the CMRR-NF would be treated in a demineralization unit to remove silica. This treatment process would reduce maintenance of boilers and other major equipment and increase equipment durability and operating life. The demineralization unit produces treated water that would be supplied to the CMRR-NF and reject water that would be discharged through the CMRR-NF sanitary wastewater system (LANL 2010c).*

have been considered in LANL forecasts for annual receipt of liquid waste at RLWTF (Balkey 2011), and no impacts on radioactive liquid waste treatment and discharge capacity are expected from its operation.

4.3.13 Transportation and Traffic

4.3.13.1 Transportation

The risk of transporting radioactive materials can be affected by a number of factors. These factors are predominantly categorized as either radiological or nonradiological impacts. Radiological impacts are those associated with the accidental release of radioactive materials and the effects of low levels of radiation emitted during normal, or incident-free, transportation. Nonradiological impacts are those associated with the transportation itself, regardless of the nature of the cargo, such as accidents resulting in death or injury when there is no release of radioactive material.

In addition to calculating the radiological risks that would result from all reasonable accidents during transportation of radioactive wastes, NNSA assessed the highest consequences of a maximum reasonably foreseeable accident with a radioactive release frequency greater than 1×10^{-7} (1 chance in 10 million) per year along the route. The consequences were determined for average atmospheric conditions. For additional information on the assumptions and methods used in the transportation analysis, see Appendix B.

At LANL, radioactive materials (SNM, low-level radioactive waste, transuranic waste, etc.) are transported both on site (between the technical areas) and off site to multiple locations. Onsite transportation constitutes the majority of activities that are part of routine operations in support of various programs. The impacts of these activities are part of the impacts of routine operations at these areas. For example, worker dose from handling and transporting radioactive materials is included as part of the worker dose from operational activities. Specific analyses performed in the 2008 *LANL SWEIS* (DOE 2008a) indicate that the projected collective radiation dose for LANL drivers from the projected onsite shipments was, on average, less than 1 millirem per transport. A review of onsite radioactive materials transportation under all alternatives in this *CMRR-NF SEIS* indicates that the 2008 *LANL SWEIS* projection of impacts would envelop the impacts for routine onsite transportation.

Transport of SNM, equipment, and other materials currently located at the CMR Building to a Modified CMRR-NF at TA-55 would occur over a period of 3 years on open or closed roads. The public is not expected to receive any measurable exposure from the one-time movement of radiological materials associated with this action. CMR Building workers could receive a minimal dose from shipping and handling of SNM during the transition from the existing CMR Building to the Modified CMRR-NF at TA-55. Based on a review of radiological exposure information in calendar year 2009, the average dose to LANL workers (including CMR Building workers and material handlers) is about 100 millirem per year. Because the transition to operations at the Modified CMRR-NF at TA-55 would occur over multiple years, the material handler worker dose would be similar to those for normal operations currently performed at the CMR Building.

Offsite transportation of radioactive materials would occur using trucks. The radioactive materials that would be transported include low-level radioactive waste and transuranic waste. For analysis purposes in this SEIS, the destinations for disposal of radioactive wastes were limited to DOE disposal sites such as the NNSS in Nevada and a commercial waste disposal site such as the Energy Solutions disposal site in Clive, Utah; disposal of transuranic waste was assumed to occur at WIPP in New Mexico.

Table 4–35 provides the estimated number of annual offsite shipments of operational wastes under each action alternative. This table also provides the estimated number of offsite shipments resulting from activities associated with construction of the Modified CMRR-NF at TA-55.

Table 4–35 Estimated Annual Offsite Shipments Under the Action Alternatives

	Annual Number of Shipments					
	Operational Wastes				*Construction Shipments* [a]	
Alternative	*Low-Level Radioactive Waste*	*Mixed Low-Level Radioactive Waste*	*Transuranic Waste*	*Hazardous Waste*	*Nonhazardous Waste*	*Materials* [b]
Modified CMRR-NF Alternative, Deep Excavation Option	176	2	13	2	20	4,300
Modified CMRR-NF Alternative, Shallow Excavation Option	176	2	13	2	20	3,300
Continued Use of CMR Building Alternative	21	1	2	1	0	0

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.

[a] Construction values are annualized values based on estimates on construction durations (about 9 years under the Modified CMRR-NF Alternative, Deep Excavation Option and Shallow Excavation Option).

[b] Materials include construction commodities: cements, gravel, sand, ash, structural and rebar steel, etc. These numbers are rounded to the nearest 100 shipments.

Construction Impacts

Routine (Incident-Free) Transportation – Deep Excavation Option—Under the Deep Excavation Option, about 4,300 shipments of construction-generated nonhazardous waste and construction commodities would be made annually (see Table 4–35). The nonhazardous waste would be transported to a regional disposal site in New Mexico (for example, Mountainair, about 130 miles [210 kilometers] away), and the construction commodities would be transported to TA-55 from a distance of up to 100 miles (160 kilometers) for sand, cement, and gravels and up to 500 miles (800 kilometers) for steels. Using these estimates, the total annual projected (one-way) distance traveled on public roads transporting construction materials to and from LANL would be about 470,000 miles (750,000 kilometers). The estimated total transportation is conservative because it assumes that all offsite material shipments would be from a distance of 100 to 500 miles (161 to 800 kilometers). It is likely that many of these shipments would be less than 100 miles (161 kilometers) because shipments of most of these materials should be obtained from Albuquerque or closer. Because no radioactive materials would be transported during construction, no radiological risks would be incurred by members of the transportation crew (truck drivers) from construction activities.

Routine (Incident-Free) Transportation – Shallow Excavation Option—Under the Shallow Excavation Option, about 3,300 shipments of construction-generated nonhazardous waste and construction commodities would be made annually (see Table 4–35). Based on the assumptions described above regarding materials and waste shipment distances, the total annual projected (one-way) distance traveled on public roads transporting construction materials to and from LANL would be about 380,000 miles (610,000 kilometers). As discussed above under the Deep Excavation Option, the estimated total transportation is conservative because it assumes that all offsite material shipments would be from a distance of 100 to 500 miles (161 to 800 kilometers). Because no radioactive materials would be transported during construction, no radiological risks would be incurred by members of the transportation crew (truck drivers) from construction activities.

Transportation Accidents – Deep Excavation Option—Under the Deep Excavation Option, the impacts of transporting construction materials were evaluated in terms of the distance traveled and number of expected traffic accidents and fatalities. The annual transportation impacts under this option would be 0 (0.3) traffic accidents and no (0.03) traffic fatalities.

Transportation Accidents – Shallow Excavation Option—Under the Shallow Excavation Option, the impacts of transporting construction materials were evaluated in terms of distance traveled and number of expected traffic accidents and fatalities. The transportation impacts under this option would be 0 (0.02) traffic accidents and no (0.02) traffic fatalities.

Operations Impacts

Routine (Incident-Free) Transportation—**Table 4–36** summarizes the total transportation impacts, as well as transportation impacts on two nearby LANL transportation routes: (1) LANL to Pojoaque, New Mexico, the route segment used by trucks from LANL, and (2) Pojoaque to Santa Fe, New Mexico, the route segment used by trucks traveling on Interstate 25 (such as trucks traveling to WIPP). For analysis purposes in this SEIS, two sites, the DOE NNSS and a commercial facility in Utah, were selected as possible disposal sites for all low-level radioactive wastes should the decision be made to dispose of low-level radioactive waste off site rather than on site. Differences in distance to these two sites and the affected population along the transportation routes result in a range of impacts under each alternative.

Table 4–36 Modified CMRR-NF Alternative — Annual Risks of Transporting Operational Radioactive Materials

Transport Segments	Offsite Disposal Option [a]	Number of Shipments	Round Trip Kilometers Traveled (thousand)	Incident-Free				Accident	
				Crew		Population			
				Dose (person-rem)	Risk [b]	Dose (person-rem)	Risk [b]	Radiological Risk [b]	Nonradio-logical Risk [b]
LANL to Pojoaque	NNSS	191	11.9	0.07	0.00004	0.02	0.00001	4×10^{-9}	0.00022
Pojoaque to Santa Fe		191	19.9	0.12	0.00007	0.04	0.00002	4×10^{-9}	0.0004
Total Route		191	461	2.5	0.002	0.8	0.0005	1×10^{-7}	0.007
LANL to Pojoaque	Commercial	191	11.9	0.07	0.00004	0.02	0.00001	4×10^{-9}	0.0002
Pojoaque to Santa Fe [c]		13	1.0	0.03	0.00002	0.01	5×10^{-6}	2×10^{-9}	0.00003
Total Route		191	399	2.2	0.001	0.7	0.0004	1×10^{-7}	0.006

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory.; NNSS = Nevada National Security Site.

[a] Under this option, low-level radioactive waste would be shipped to either the NNSS or a commercial site in Utah. Transuranic waste would be shipped to WIPP.

[b] Risk is expressed in terms of latent cancer fatalities, except for the nonradiological, where it refers to the number of traffic accident fatalities.

[c] Shipments of low-level radioactive waste to a commercial disposal site in Utah would not pass along the Pojoaque to Santa Fe segment of highway.

Under this alternative, about 191 offsite shipments of radioactive materials would be made annually to the NNSS in Nevada (or a commercial site in Clive, Utah) and WIPP in New Mexico (see Table 4–36). Maximum transportation impacts would be realized if low-level and mixed low-level radioactive waste were shipped to either the NNSS in Nevada or a commercial site in Clive, Utah, instead of being disposed of on site. Transuranic waste would be shipped to WIPP. The total projected (one-way) distance traveled on public roads transporting radioactive materials to various locations would range from about 125,000 to 144,000 miles (200,000 to 231,000 kilometers).

The annual dose to the transportation crew from all offsite transportation activities under the Modified CMRR-NF Alternative was estimated to range from about 2.2 person-rem for disposal at the commercial low-level radioactive waste disposal site in Clive, Utah, to about 2.5 person-rem for disposal at the NNSS in Nevada. The dose to the general population would range from 0.7 to 0.8 person-rem for the commercial site in Clive, Utah, and the NNSS in Nevada, respectively. Accordingly, incident-free transportation would result in a maximum of no (0.002) excess LCFs among the transportation workers and no (0.0005) excess LCFs in the affected population. The estimated dose associated with transport of low-level and mixed low-level radioactive waste to the NNSS in Nevada is higher because of the longer distance traveled and larger affected population. The differences in estimated doses under either disposal option are very small, however, as shown above.

Note that DOE regulations limit the maximum annual dose to a transportation worker to 100 millirem per year unless the individual is a trained radiation worker. The dose to a trained radiation worker is limited to 2 rem per year (DOE 1999b). The potential for a trained radiation worker to develop a fatal latent cancer from an annual dose at the maximum annual exposure is 0.0012. Therefore, an individual transportation worker is not expected to develop a lifetime latent fatal cancer from exposure during these activities.

The doses to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, were estimated to be a maximum of 0.04 person-rem. This dose would result in no (0.00002) excess LCFs among the exposed populations.

Transportation Accidents—Two sets of analyses were performed for the evaluation of transportation accident impacts involving radioactive materials transport: impacts of maximum reasonably foreseeable accidents (accidents with probabilities greater than 1 in 10 million per year [1×10^{-7}]) and impacts of all accidents (total transportation accidents).

For radioactive materials transported under the Modified CMRR-NF Alternative, the maximum reasonably foreseeable offsite truck transportation accident with the greatest consequence would involve a truck carrying contact-handled transuranic waste. The probability that such an accident would occur is about 1 in 3.6 million (2.8×10^{-7}) per year in a suburban area. If such an accident occurs, the consequences in terms of general population dose would be 8 person-rem. Such an exposure would result in no (0.005) excess LCFs among the exposed population. This accident would result in a dose of 8.2 millirem to a hypothetical MEI located at a distance of 330 feet (100 meters) and exposed to the accident plume for 2 hours, with a corresponding risk of developing a latent fatal cancer of about 1 in 200,000 (5×10^{-6}).

Under this alternative, the estimated risks for all projected accidents involving radioactive shipments, regardless of type, are a maximum radiological dose-risk[14] to the general population of about 0.2 person millirem, resulting in 1×10^{-7} LCFs, and a maximum nonradiological (traffic) accident risk of zero (0.007) fatalities.

The maximum radiological transportation accident dose-risk to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, would be 0.0067 person-millirem. This dose would result in no (4×10^{-9}) excess LCFs among the exposed populations. The maximum expected number of traffic accident fatalities along these routes would be zero (0.0004).

[14] *Dose-risk includes the probability that an accident will occur. Here, these values were calculated by dividing the radiological risks in terms of LCFs given in Table 4–36 (column 9) by 0.0006, which is the risk of an LCF per person-rem of exposure.*

The impacts of transporting nonradiological materials were also evaluated. These impacts are presented in terms of distance traveled and numbers of expected traffic accidents and fatalities. The following assumptions were made: asbestos would be disposed of at a facility in Phoenix, Arizona; hazardous waste would be disposed of at a facility in Andrews, Texas; and solid waste would be disposed of at Mountainair, New Mexico. As indicated in Table 4–35, only two shipments of hazardous materials would be made annually. The transportation under this alternative would result in 666 miles (1,100 kilometers) traveled, no (0.0002) traffic accidents, and no (0.00002) fatalities.

4.3.13.2 Traffic

Construction Impacts – Deep Excavation Option – Truck Traffic—Under the Deep Excavation Option, an additional 100 feet (30 meters) would be excavated during construction of the Modified CMRR-NF, as approximately 30 feet (9.1 meters) of the Modified CMRR-NF excavation have already been completed. Excavation of the additional 100 feet (30 meters) and the associated tunnels would require the removal of approximately 545,000 cubic yards (420,000 cubic meters), or approximately 900,000 tons (820,000 metric tons) of material. This amount of material would require approximately 45,000 20-ton truck trips or 30,000 30-ton truck trips to move. This material would be staged at a LANL materials staging area for future reuse on other LANL projects. Reuse of this material at LANL would directly offset the future need to transport purchased fill material from offsite locations, as is currently the case because of the limited amount of suitable fill material available within existing LANL borrow pits. Excavated soil and rock material from the Modified CMRR-NF would be transported by truck to spoils storage areas within TA-5, TA-36, TA-51, TA-52, or TA-54 in accordance with routine material reuse practices at LANL, and the excavated material (spoils) would ultimately be reused in various construction and landscaping projects at LANL.

As discussed under the No Action Alternative, each round trip to the LANL materials staging area would take approximately 20 minutes. Moving the material generated by excavation under the Deep Excavation Option would take approximately 450 10-hour shifts with one loader and 20-ton trucks or approximately 300 10-hour shifts with one loader and 30-ton trucks. This time period could be shortened by using two loaders and additional trucks. On a per-hour basis, these trips would make little difference to the level of service on Pajarito Road. The acceleration of the loaded earthwork trucks would be slow and would result in lower speeds and some reduction in the level of service in the road segment where the trucks accelerate. Pajarito Road is not accessible by the public.

The use of onsite concrete batch plants under the Deep Excavation Option would be required. The largest volume of concrete would be anticipated in the early years of the project as the 60 feet (18 meters) of low-slump concrete fill and the basemat and foundation of the building are constructed. It is not expected that the plants would be operated simultaneously. Depending on the quality of the concrete specified for the low-slump fill material, it may or may not be necessary to use cement mixers for a trip this short. Regardless of whether cement mixers or dump trucks are used to transport the concrete, the weight limit would be approximately 20 tons (18 metric tons) for three-axle trucks. Wet concrete weighs approximately 2 tons (1.8 metric tons) per cubic yard. Structural concrete for the shell of the Modified CMRR-NF would be conveyed from the batch plant to the site using cement mixer trucks.

Peak operation of the northeast (TA-48/55) concrete plant is expected during the first year of Modified CMRR-NF construction (2012), when the plant would be used to produce an estimated 250,000 cubic yards (190,000 cubic meters) of low-slump concrete that would be placed in the lower 60 feet (18 meters) of the Modified CMRR-NF excavation for soil stabilization (LANL 2010d).

If the peak operation of this concrete plant is 150 cubic yards (115 cubic meters) per hour and 20-ton trucks are used for transport, it would take approximately 170 10-hour shifts to transport 250,000 cubic yards (190,000 cubic meters) of concrete. This timeframe could be reduced to approximately 70 days with 24-hour operations.

Bulk concrete materials would be delivered to the Modified CMRR-NF construction site by either standard three-axle dump trucks (20-ton trucks) or five-axle bottom dump trucks (30-ton trucks).

To support the concrete batch plant operation for all concrete operations, the following materials would be required (LANL 2011):

- Approximately 313,000 tons (284,000 metric tons) of coarse aggregate (15,700 20-ton trucks or 10,400 30-ton trucks)

- Approximately 320,000 tons (290,000 metric tons) of fine aggregate (sand) (16,000 20-ton trucks or 10,700 30-ton trucks)

- Approximately 69,000 tons (63,000 metric tons) of cement (3,500 20-ton trucks or 2,300 30-ton trucks)

- Approximately 37,000 tons (34,000 metric tons) of fly ash (1,900 20-ton trucks or 1,200 30-ton trucks)

This operation would add a maximum of approximately 66 truck trips per hour to Pajarito Road. Current peak-hour traffic volume on Pajarito Road is anticipated to be 800 vehicles per hour (Level of Service D). The capacity of a two-lane roadway is approximately 2,400 trips per hour. The acceleration of the loaded concrete trucks would be slow and, with a distance of less than one-eighth of a mile for some of the loaded concrete trucks, would result in considerably lower speeds in this road segment. The section of Pajarito Road from the floor of the valley to the top of the mesa would also be impacted by the slow speed of loaded trucks climbing this hill. The addition of the truck trips hauling materials for concrete production is not expected to change the level of service on this road segment. This issue could be mitigated by adding a truck climbing lane on this stretch of roadway. During the construction period, climbing lanes could be warranted; however, this condition would be temporary, and truck deliveries could be scheduled to avoid peak traffic hours.

Construction under the Deep Excavation Option would also require the following amounts of steel (LANL 2011):

- Approximately 560 tons (510 metric tons) of structural steel (30 20-ton trucks or 20 30-ton trucks)

- Approximately 18,000 tons of concrete reinforcing steel (900 20-ton trucks or 600 30-ton trucks)

All construction supplies reaching the site must use Pajarito Road. All movement of excavated material from the Modified CMRR-NF to the internal storage areas must use Pajarito Road. The movement of large numbers of heavy trucks can damage the structure of existing pavement, reducing its lifespan and requiring repair or replacement. If the pavement structure is not sufficiently strong, the driving pavement can rut or crumble. The edges of existing pavements are vulnerable to crumbling if sufficient lateral support is not provided. The impacts on Pajarito Road’s structural integrity would be similar to those discussed under the No Action Alternative; however, there is a greater chance of structural damage to Pajarito Road under the Modified CMRR-NF Alternative due to the greater total weight of materials that would be transported on the roadway and the longer duration of transports. Pajarito Road may be sufficiently strong to support the transports without damage if the underlying soil is strong. Should damage occur to the roadway surface, Pajarito Road may require rehabilitation or repair sooner than currently anticipated.

Construction Impacts – Deep Excavation Option – Worker Traffic—The workers going to the Modified CMRR-NF are expected to use the public roadways. A peak of 790 workers is anticipated to commute to the parking area at TA-72 (LANL 2010b). For this analysis, the peak commuting time of these workers would align with the peak-hour traffic on the adjoining public roadways. Approximately 500 peak-hour trips are anticipated from a peak of 790 construction workers. These 500 additional peak hour (worker) commuters were added to the existing traffic to determine the anticipated level of service. As shown in **Table 4–37**, the impacts on traffic were compared for the year 2012, the year that the Deep Excavation Option would start, and 2020, the year that construction would be completed under this alternative. No change in the level of service of roadways in the vicinity of LANL is anticipated during the construction period. In addition, the impacts of construction traffic would be minimal as it is anticipated that workers for the Modified CMRR-NF would park at the parking lot in TA-72 and would be bused to the worksite.

Table 4–37 Modified CMRR-NF Alternative — Expected Levels of Service of Roadways in the Vicinity of Los Alamos National Laboratory

Location	*Road Type and Number of Lanes*	*AADT/Year/ Percentage Trucks*	*Existing Traffic*		*Deep Excavation Option*		*Comments (assumed percentage of construction traffic assigned to road segment)(790 workers, 500 VPH peak)*
			AADT/ Peak Hour/ LOS	*AADT/ Peak Hour/ LOS*	*Peak Hour/ LOS*	*Peak Hour/ LOS*	
Year			*2012*	*2020*	*2012*	*2020*	
SR 4 at Los Alamos County Line to SR 501	Minor arterial/ two lanes	734/ 2009/9	760/80/A	840/80/A	130/A	130/A	(10) No change in LOS
SR 4 at Junction Bandelier Park Entrance	Minor arterial/ two lanes	681/ 2009/7	700/70/A	770/80/A	120/A	130/A	(10) No change in LOS
SR 4 at Junction of Pajarito Road – White Rock	Minor arterial/ two lanes	9,302/ 2009/9	9,580/ 960/D	10,580/ 1,060/D	1,410/D	1,510/D	(90) No change in LOS
SR 4 at Junction of Jemez Road	Minor arterial/ two lanes	9,358/ 2009/12	9,640/ 960/D	10,650/ 1,070/D	1,410/D	1,520/D	(90) No change in LOS
SR 501 at Junction of SR 4 to Diamond Drive	Minor arterial/ two lanes	11,848/ 2009/11	12,210/ 1,220/D	13,490/ 1,350/D	1,670/D	1,800/D	(50) No change in LOS
SR 501 at Junction of Diamond Drive and Onward	Primary arterial/ four lanes	21,211/ 2009/8	21,850/ 2,190/C	24,140/ 2,410/C	2,640/C	2,860/C	(90) No change in LOS
SR 501 at Junction 502	Primary arterial/ four lanes – divided	17,807/ 2009/8	18,350/ 1,840/C	20,270/ 2,030/C	1,940/C	2,130/C	(20) No change in LOS
SR 502 at Junction Openheimer Street	Primary arterial/ four lanes – divided	12,817/ 2009/6	13,210/ 1,320/C	14,590/ 1,460/C	1,420/C	1,560/C	(20) No change in LOS
SR 502 East of Junction with SR 4	Primary arterial/ four-lane freeway	6,341/ 2009/12	6,530/ 650/A	7,210/ 720/A	700/A	770/A	(10) No change in LOS

AADT = average annual daily traffic; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LOS = level of service; SR = State Road; VPH = vehicles per hour.

Construction Impacts – Shallow Excavation Option – Truck Traffic—The impacts of construction on peak-hour levels of service on public roadways adjoining LANL under the Shallow Excavation Option would be similar to those anticipated under the Deep Excavation Option. Construction under the Shallow Excavation Option would require the excavation and removal of 236,000 cubic yards (180,000 cubic meters), or 390,000 tons (350,000 metric tons) of material. This amount of material would require approximately 19,500 20-ton truck trips or 13,000 30-ton truck trips to move. As under the Deep Excavation Option, the material would be staged for future reuse on other LANL projects.

As discussed under the No Action Alternative, each round trip to the LANL materials staging area would take approximately 20 minutes. To move the material generated by excavation under the Shallow Excavation Option would take approximately 195 10-hour shifts with one loader and 20-ton trucks or approximately 130 10-hour shifts with one loader and 30-ton trucks. This time period could be shortened by using two loaders and additional trucks. As under the Deep Excavation Option, these trips would be make little difference to the level of service on Pajarito Road.

Compared to the Deep Excavation Option, there would be no need for a large volume of concrete for a building foundation subgrade replacement of the poorly welded tuff layer. This would reduce the number of trucks transporting concrete mix from the batch plant to the Modified CMRR-NF. While the total number of trucks would be reduced, the number of trucks in a peak hour is expected to remain the same. Thus, the impact on the roadway level of service would remain the same, although the duration of construction-related traffic would be reduced.

The same amount of steel would be required under the Shallow Excavation Option as under the Deep Excavation Option. To support the concrete batch plant operation under the Shallow Excavation Option for all concrete operations, the following materials would be required (LANL 2011):

- Approximately 120,000 tons (110,000 metric tons) of coarse aggregate (6,000 20-ton trucks or 4,000 30-ton trucks)
- Approximately 120,000 tons (110,000 metric tons) of fine aggregate (sand) (6,000 20-ton trucks or 4,000 30-ton trucks)
- Approximately 26,000 tons (24,000 metric tons) of cement (1,300 20-ton trucks or 900 30-ton trucks)
- Approximately 14,000 tons (13,000 metric tons) of fly ash (700 20-ton trucks or 500 30-ton trucks)

All supplies reaching the site must use Pajarito Road. The structural impacts on internal LANL roadways would be less under the Shallow Excavation Option than the Deep Excavation Option due to the lesser amount of concrete that would be needed to support construction.

Construction Impacts – Shallow Excavation Option – Worker Traffic—The peak number of workers going to the Modified CMRR-NF is expected to be approximately the same under the Shallow Excavation Option as under the Deep Excavation Option. The 790 additional (worker) commuters were added to the existing traffic to determine the anticipated level of service. The impacts on traffic were compared for the year 2012, the year that the Shallow Excavation Option construction would start, and 2020, the year that the Shallow Excavation Option construction would be completed. The results are the same as those shown for the Deep Option in Table 4–37. No change in the level of service of roadways in the vicinity of LANL is anticipated during the construction period. In addition, the impacts of construction traffic would be minimal because it is anticipated that workers for the Modified CMRR-NF would park at the parking lot in TA-72 and would be bused to the worksite.

Operations Impacts—Employees currently working at the existing CMR Building and other facilities at LANL are expected to occupy the Modified CMRR-NF. There would be no net increase in the number of employees at LANL as a result of operating the Modified CMRR-NF. Because no net increase in employees is anticipated to support Modified CMRR-NF operations under the Modified CMRR-NF Alternative, compared with employees supporting the existing CMR Building, there would be no significant impact on traffic or transportation on the public roadways external to LANL and the vehicle access portals. Those employees accessing the CMRR-NF from the east would have a shorter commute on the internal LANL roadway system and those employees accessing the CMRR-NF from the west would have a longer commute on the internal LANL roadway system. No change in the level of service of the internal LANL roadways impacted by these changes in commuting patterns is anticipated.

4.4 Environmental Impacts of the Continued Use of CMR Building Alternative

4.4.1 Continued Use of CMR Building Alternative

This section presents the environmental impacts associated with the Continued Use of CMR Building Alternative. Under this alternative, the existing CMR Building at TA-3 would continue operations with necessary maintenance and component replacements, as described in Chapter 2, Section 2.6.3. Under this alternative, there would be no construction of a new CMRR-NF. CMR Building operations and capabilities would continue to be restricted to levels necessary to maintain an acceptable level of risk to public and worker health and safety. In addition, operation of RLUOB would be included under this alternative, as well as the relocation of a number of people currently working in the CMR Building to RLUOB.

4.4.2 Land Use and Visual Resources

Operations Impacts—Because there would be no land disturbance (no construction) within TA-3 or TA-55 or anywhere else at LANL under this alternative, there would be no impact on land use or the visual environment. Furthermore, continued operation of the existing CMR Building and RLUOB would not change either the land use within or the appearance of TA-3 or TA-55.

4.4.3 Site Infrastructure

Operations Impacts—Projected site infrastructure requirements of CMR Building operations under the Continued Use of CMR Building Alternative are presented in **Table 4–38**. Current CMR Building operations are included in current site requirements and have already been accounted for in the current available site capacities for electricity and water (see Chapter 3, Table 3–3). The addition of RLUOB would add to these requirements under this alternative. As shown in Table 4–38, the combined requirements of the CMR Building and RLUOB make up less than 1 percent of the available site capacity for natural gas and 42 percent of the available site capacity for peak electrical load. Existing infrastructure should be capable of supporting these additional requirements without exceeding capacities. Thus, the net impact on infrastructure is expected to be minimal.

Table 4–38 Continued Use of CMR Building Alternative — Site Infrastructure Requirements for CMR Building and RLUOB Operations

Resource	*Available Site Capacity* [a]	*CMR Building Requirement* [b]	*RLUOB Requirement*	*Total Requirement* [b]	*Percentage of Available Site Capacity*
Electricity					
Energy (megawatt-hours per year)	601,000	No change	59,000	59,000	10
Peak load demand (megawatts)	26	No change	11	11	42
Fuel					
Natural gas (million cubic feet per year)	5,860	No change	38	38	0.6
Water (million gallons per year)	130	No change	7	7	5.4

CMR = Chemistry and Metallurgy Research; RLUOB = Radiological Laboratory/Utility/Office Building.
[a] A calculation based on the system-wide capacity (site-wide for water) minus the current site requirements
[b] The Continued Use of CMR Building Alternative is a continuation of current CMR activities and associated infrastructure requirements. The utilities at the CMR Building are not metered so there are no reliable estimates of utility usage. The values for the "Available Site Capacity" column account for the CMR Building utilities being in the site-wide totals.
Note: Values have been rounded.
Source: LANL 2011.

4.4.4 Air Quality and Noise

4.4.4.1 Air Quality

Operations Impacts—Air quality impacts associated with the continued operation of the existing CMR Building were analyzed under the No Action Alternative in the *CMRR EIS*. There would be no increases in emissions or air pollutant concentrations for nonradiological releases (DOE 2003b).

Operation of RLUOB would have minimal air quality impacts. Sources of emissions would occur from daily employee commutes and the testing of an emergency backup generator. Nonradiological emissions for the criteria pollutants were estimated in **Table 4–39**.

Table 4–39 Continued Use of CMR Building Alternative — Nonradiological Operational Emissions of RLUOB

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)*	*Maximum Incremental Concentration (parts per million)*
Carbon monoxide	1 hour	13.1	0.0004
	8 hours	8.7	0.0003
Nitrogen dioxide	Annual	0.05	5.8×10^{-6}
Sulfur dioxide	3 hours	0.5 [a]	6.5×10^{-5}
	24 hours	0.1	1.4×10^{-5}
	Annual	0.02	2.8×10^{-6}
PM_{10}	24 hours	150 μg/m³	0.007 μg/m³
Total Suspended Particulates	24 hours	150 μg/m³	2.4 μg/m³
	Annual	60 μg/m³	0 μg/m³

μg/m³ = micrograms per cubic meter; CMR = Chemistry and Metallurgy Research; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers; RLUOB = Radiological Laboratory/Utility/Office Building.
[a] NMAAQS does not have a 3-hour sulfur dioxide standard; therefore, the Federal NAAQS standard is used.
Note: Values have been rounded.
Source: LANL 2011.

Radiological emissions, estimated at 0.00003 curies per year of actinides, could be released from the CMR Building operations. Impacts of these radiological releases are discussed in Section 4.4.10.

4.4.4.2 Greenhouse Gas Emissions

Operations Impacts—Operations at the CMR Building and RLUOB would release greenhouse gases from refrigerants, a backup generator, and employee commutes.[15] Greenhouse gas emissions from utilities (for example, electricity) do not occur directly on site. Total greenhouse gases during normal operations of the existing CMR Building and RLUOB would be approximately 3,400 tons (3,100 metric tons) of carbon-dioxide equivalent per year (see **Table 4–40**). The current greenhouse gas inventory for LANL includes the existing CMR Building; therefore, continued operation of this building would not change the site's current greenhouse gas emissions.

Total greenhouse gases, including both indirect (Scope 2) and direct (Scope 1) emissions during operations of the existing CMR Building and RLUOB would be approximately 42,300 tons (38,000 metric tons) of carbon-dioxide equivalent per year (see Table 4–40). Greenhouse gas emissions for the continued use of CMR Building operating with the RLUOB would be approximately 10 percent of the total site-wide carbon-dioxide-equivalent emissions per year. These greenhouse gases emitted by operations under the Continued Use of CMR Building Alternative would add a relatively small increment to emissions of these gases in the United States and the world.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 25,000 metric tons or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. Together, the Scope 1 emissions under Continued Use of CMR Building Alternative would be approximately 3,400 tons (3,100 metric tons) of carbon-dioxide equivalent per year and are below the CEQ suggested evaluation level of 25,000 metric tons per year.

Table 4–40 Continued Use of CMR Building Alternative — CMR Building and RLUOB Operations Emissions of Greenhouse Gases

		Emissions (tons per year)				
Emissions Scope	***Activity***	***CO_2***	***CH_4 CO_2e***	***N_2O CO_2e***	***HFC CO_2e***	***Total CO_2e***
Scope 1 [a]	Refrigerants used	N/A	N/A	N/A	3,400	3,400
	Backup generator	2	0	0	N/A	2
	Subtotal	2	0	0	3,400	3,400
Scope 2 [b]	Electricity use	38,700	11	160	N/A	38,900
	Total	38,700	11	160	3,400	42,300

CMR = Chemistry and Metallurgy Research; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent; HFC CO_2e = hydrofluorocarbons in carbon-dioxide equivalent; N/A = not applicable; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Scope 1 sources include direct emissions by stationary sources owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding.

[15] *Since there would be no new hires under this alternative, emissions from personnel commutes included in the baseline inventory are not included here.*

4.4.4.3 Noise

Operations Impacts—Under this alternative, there would be no new construction or major changes in operations or employment levels. Thus, there would be no change in noise impacts under the Continued Use of CMR Building Alternative.

4.4.5 Geology and Soils

Operations Impacts—Geologic impacts associated with continued operations at the existing CMR Building would primarily consist of regional and local seismic hazards, including earthquakes and potential fault rupture, as summarized in Chapter 3, Section 3.5, and further detailed in the *CMRR EIS* (DOE 2003b) and the *LANL SWEIS* (DOE 2008a). In particular, core drilling studies and geologic mapping have established a number of secondary fault features at TA-3, including a high-angle, southwest-to-northeast-trending fault trace associated with the Rendija Canyon Fault Zone beneath the northern portion of the CMR Building. These fault studies indicate that 8 feet (2.4 meters) of fault displacement have occurred at the CMR Building site. Although the potential for ground deformation from fault rupture is relatively low, with a minimum recurrence interval of 4,000 years, the presence of identified fault structures in association with an identified active and capable fault zone (per 10 CFR Part 100, Appendix A) restricts the operational capability of the existing CMR Building without substantial upgrades and repairs.

Under this alternative, there would be no additional impacts on geology and soils from operations of RLUOB at TA-55 under normal operating conditions.

4.4.6 Surface-Water and Groundwater Quality

Under this alternative, no impacts on surface-water resources or groundwater quality are anticipated during CMR Building and RLUOB operations. Industrial and sanitary effluents would be discharged to sanitary sewer lines for treatment at the Sanitary Wastewater Systems Plant in TA-46. Spill prevention, countermeasures, and control procedures would be employed during operations and transmission of wastewaters from TA-3 and TA-55 to minimize the probability of, and the potential for, an unplanned release that could infiltrate and affect groundwater (LANL 2010d).

4.4.7 Ecological Resources

There would be no new impact on terrestrial and aquatic resources, wetlands, or threatened and endangered species at LANL because no new facilities would be built under the Continued Use of CMR Building Alternative. The CMR Building and RLUOB would not produce emissions or effluent of a quality or at levels that would likely affect wildlife and other ecological resources.

4.4.8 Cultural and Paleontological Resources

Because there would be no land disturbance (no construction) under this alternative, there would be no impact on cultural resources. Further, continued operations at the existing CMR Building or RLUOB would not affect these resources within either TA-3, TA-55, or the site as a whole. Impacts of CMR Building decontamination, decommissioning, and demolition (DD&D) are addressed in Section 4.5.1.

4.4.9 Socioeconomics

Operations Impacts—Under the Continued Use of CMR Building Alternative, the current employment of approximately 210 workers at the existing CMR Building would continue, although many of these workers may have their offices moved to RLUOB. RLUOB operations would also draw about 140 employees from other locations on the site. No new employment of workers would be required. Therefore, there would be no additional impact on the socioeconomic conditions around LANL under this alternative.

4.4.10 Human Health Impacts

4.4.10.1 Normal Operations

The inventory of radioactive material released in air emissions would be smaller under this alternative than under other alternatives. The inventory of radionuclides emitted under this alternative includes only actinides and none of the fission products and tritium that could be associated with a fully operating CMRR-NF. Emissions from RLUOB, which has a radiological laboratory, would be expected to be a small fraction of those estimated to be released from the CMR Building and are not analyzed separately.

The air emissions would be in the form of plutonium, uranium, thorium, and americium isotopes. For conservatism in estimating the human health impacts, all emissions were considered to be plutonium-239 because the human health impacts on a per-curie basis are greater for plutonium-239 than for the other actinides associated with CMR Building activities. **Table 4–41** shows the annual collective dose to the general public living within 50 miles (80 kilometers) of the CMR Building, an average member of the public living within this radius, and an offsite MEI (a hypothetical member of the public residing at the LANL site boundary who receives the maximum dose).

Table 4–41 shows that the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the CMR Building was estimated to be 0.014 person-rem under this alternative. This dose would increase the annual risk of a single latent fatal cancer in the population by 8×10^{-6}. Another way of stating this is that the likelihood that one fatal cancer would occur in the projected 2030 population of about 536,000 people from radiological releases associated with the CMR Building located at TA-3 is about 1 chance in 125,000 per year.

Table 4–41 Continued Use of CMR Building Alternative — Annual Radiological Impacts of CMR Building Operations on the Public

	Population Within 50 Miles (80 kilometers)	*Average Individual Within 50 Miles (80 kilometers)*	*Maximally Exposed Individual*
Dose	0.014 person-rem	0.000027 millirem	0.0023 millirem
Cancer fatality risk [a]	8×10^{-6}	2×10^{-11}	1×10^{-9}
Regulatory dose limit [b]	Not applicable	10 millirem	10 millirem
Dose as a percentage of regulatory limit	Not applicable	0.0003	0.02
Dose from background radiation [c]	260,000 person-rem	480 millirem	480 millirem
Dose as a percentage of background dose	5×10^{-6}	5×10^{-6}	0.0005

CMR = Chemistry and Metallurgy Research.
[a] Based on a risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).
[b] 40 CFR Part 61, Subpart H, establishes an annual limit of 10 millirem via the air pathway to any member of the public from DOE operations. There is no standard for a population dose.
[c] The annual individual dose from background radiation at LANL is 480 millirem (see source of ubiquitous background radiation in Chapter 3, Section 3.11.1). The 2030 projected population living within 50 miles (80 kilometers) of TA-3 was estimated to be about 536,000.
Note: To convert miles to kilometers, multiply by 0.62137.

The average annual dose to an individual in the population would be 0.000027 millirem under this alternative. The corresponding increased risk of an individual developing a fatal cancer from receiving the average dose would be 2×10^{-11} per year, or essentially zero.

The MEI would receive an estimated annual dose of 0.0023 millirem. This dose corresponds to an increased annual risk of developing a fatal cancer of 1×10^{-9}. In other words, the likelihood that the MEI would develop a fatal cancer is about 1 chance in 1 billion for each year of CMR Building operations.

Estimated annual doses to workers involved with CMR Building activities under this alternative are provided in **Table 4–42**. The estimated worker doses are based on historical exposure data for LANL workers and estimates for work to be performed at RLUOB (LANL 2011). Based on the reported data, the average annual dose to a LANL worker who received a measurable dose was 93 millirem. A value of 100 millirem has been used as the estimate of the average annual worker dose per year of operations at the CMR Building.

The average annual worker dose of 100 millirem at the CMR Building and 20 millirem at RLUOB is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). The CMR Building average annual dose corresponds to an increased risk of a fatal cancer of 0.00006 per year. In other words, the likelihood that a CMR Building worker would develop a fatal cancer from work-related exposure is about 1 chance in 17,000 for each year of operations.

Table 4–42 Continued Use of CMR Building Alternative — Annual Radiological Impacts of CMR Building and RLUOB Operations on Workers

	Individual Worker	*Worker Population* [a]
CMR Building dose/fatal cancer risk [b, c]	100 millirem/0.00006	21 person-rem/0.013
RLUOB dose/fatal cancer risk [c]	20 millirem/0.00001	2.8 person-rem/0.0017
Total	Not applicable	24 person-rem/0.014
Dose limit [d, e]	5,000 millirem	Not applicable
Administrative control level [f]	500 millirem	Not applicable

CMR = Chemistry and Metallurgy Research; RLUOB = Radiological Laboratory/Utility/Office Building.
[a] Based on a worker population of approximately 210 for continued operations at the CMR Building and 140 for RLUOB after activities have transitioned to RLUOB.
[b] Based on the average dose to LANL workers who received a measurable dose in the period from 2007 to 2009. A program to reduce doses to as low as is reasonably achievable would be employed to reduce doses to the extent practicable.
[c] Based on a worker risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).
[d] Dose limits and administrative control levels do not exist for worker populations.
[e] 10 CFR 835.202.
[f] DOE 1999b.

Based on a radiation worker population of approximately 350 under this alternative (210 for CMR Building and 140 for RLUOB), the estimated annual worker population dose would be 24 person-rem. This worker population dose would increase the likelihood of a fatal cancer within the worker population by 0.01 per year. In other words, on an annual basis, there is about 1 chance in 100 of one latent fatal cancer developing in the entire worker population as a result of exposures associated with this alternative. The average annual worker dose of about 68 millirem is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). This average annual does corresponds to an increased risk of a latent fatal cancer of 0.00004 for each year of operations. In other words, the likelihood that a worker would develop a fatal cancer from annual work-related exposure is about 1 chance in 25,000.

Occupational injury and illness rates for normal operations under this alternative are projected to follow the patterns observed at LANL, as discussed in Chapter 3, Section 3.11.3. Using the worker population of 350, it is expected that the workers would experience about 9 TRCs and about 4 DART cases annually.

Hazardous Chemicals Impacts

No chemical-related health impacts would be associated with this alternative. As stated in the *LANL SWEIS*, the quantities of chemicals that could be released to the atmosphere during normal operations would be both minor and below the screening levels used to determine the need for additional analysis. There would be no construction and operational increase in the use of chemicals under this alternative. Workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals.

4.4.10.2 Facility Accidents

This section presents a discussion of the potential health impacts on members of the public and workers from postulated accidents at the CMR Building. Under this alternative, the CMR Building and operations would remain unchanged from current limited operations.

Radiological Impacts

Radiological impacts from facility accidents at the CMR Building were evaluated in the *CMRR EIS*. Appendix C of the *CMRR EIS* and Appendix C of this *CMRR-NF SEIS* provide the methodology and assumptions used in developing facility accident scenarios and estimating doses to the general public within 50 miles (80 kilometers), the MEI, and an onsite worker near the facility. However, the material at risk within the CMR Building has been revised to reflect the reduced operating limits currently imposed in the facility due to safety and seismic concerns associated with the facility, as described below. The only other changes in the parameters used from those presented in Appendix C of the *CMRR EIS* are a new population distribution within 50 miles (80 kilometers) of the CMR Building projected to 2030 (projected to be about 536,000 persons), as well as a revised distance to the nearest offsite individual of 0.42 miles (0.67 kilometers) from the CMR Building. All other assumptions are consistent with those presented in Appendix C of the *CMRR EIS*. The doses presented in the *CMRR EIS* were calculated using MACCS2, Version 1.12. In this *CMRR-NF SEIS*, doses were estimated using MACCS2, Version 1.13.1, which corrected numerous known errors in the previous version of the code.

The accident scenarios in the *CMRR EIS* for the CMR Building were reviewed and compared with the accidents in the recent safety analysis documentation for the CMR Building (LANS 2011a). For this existing building, the safety-basis scenarios and the NEPA scenarios are similar because they are based on the existing facility and the existing safety analyses. The principal differences between the safety-basis approach and the NEPA approach are the degrees of conservatism in the estimations of the material at risk, release mechanisms, damage ratios, fractions made airborne and respirable, and leak path factors. The safety-basis scenarios below assume damage ratios of 1.0, which are likely conservative by a factor of 10 or more. The fractions made airborne and respirable by the real-world stresses implied by these scenarios are also conservative. Because of the age and construction of the building, the NEPA scenarios would assume similar damage ratios and leak path factors to those of the safety-basis scenarios, and no separate analyses are provided. It is estimated that real-world releases for any of these CMR Building accident scenarios would be somewhat lower than these safety-basis estimates. Operational practices and limits at the CMR Building limit the potential consequences of these accidents by limiting the material at risk within the building.

Tables 4–43 and **4–44** provide the revised population doses and risks from facility accidents. Table 4–43 presents the frequencies and consequences of a postulated set of accidents for the public, represented by the MEI and the general population living within 50 miles (80 kilometers) of the CMR Building, and a noninvolved worker located at the technical area boundary, a distance of 300 yards (280 meters) from the CMR Building. Table 4–44 presents the cancer risks, obtained by multiplying each accident's consequences by the upper limit on the likelihood (frequency per year) that the accident would occur.

Table 4–43 Continued Use of CMR Building Alternative — Accident Frequency and Consequences

Accident	Frequency (per year)	Maximally Exposed Individual		Offsite Population [a]		Noninvolved Worker at TA Boundary	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Wing-wide fire [d]	0.01	0.26	0.0002	130	0 (0.08)	0.65	0.0004
Seismically induced spill	0.01	2.2	0.001	450	0 (0.3)	21	0.03
Seismically induced fire	0.0001	4.3	0.003	900	1 (0.5)	42	0.05
Loading-dock spill/fire	0.01	0.07	0.00004	8.5	0 (0.005)	0.7	0.0004

CMR = Chemistry and Metallurgy Research; TA = technical area.
[a] Based on a projected 2030 population estimate of about 536,000 persons residing within 50 miles (80 kilometers) of TA-3.
[b] Increased likelihood of an LCF for an individual if the accident occurs.
[c] Increased number of LCFs for the offsite population if the accident occurs (results rounded to 1 significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.
[d] A major fire involving two wings.

Table 4–44 Continued Use of CMR Building Alternative — Annual Accident Risks

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Individual [a]	Offsite Population [b, c]	Noninvolved Worker at TA Boundary [a]
Wing-wide fire	2×10^{-6}	8×10^{-4}	4×10^{-6}
Seismically induced spill	1×10^{-5}	3×10^{-3}	3×10^{-4}
Seismically induced fire	3×10^{-7}	5×10^{-5}	5×10^{-6}
Loading-dock spill/fire	4×10^{-7}	5×10^{-5}	4×10^{-6}

CMR = Chemistry and Metallurgy Research; TA = technical area.
[a] Risk of increased likelihood of an LCF to the individual.
[b] Risk of increased number of LCFs for the offsite population.
[c] Based on a projected 2030 estimated population of about 536,000 persons residing within 50 miles (80 kilometers) of TA-3.

The accident with the highest potential risk to the offsite population (see Table 4–44) would be an earthquake that would severely damage the CMR Building, resulting in a seismically induced spill of radioactive materials with an annual risk of an LCF for the offsite MEI of 1×10^{-5}. In other words, the offsite MEI's likelihood of developing a latent fatal cancer from this event is about 1 chance in 100,000. This accident would increase the risk of a single LCF in the entire population by 3×10^{-3} per year. In other words, the likelihood of one fatal cancer in the entire population from this event would be about 1 chance in 333 per year. Statistically, the radiological risk for the average individual in the population would be small. The risk of an LCF to a noninvolved worker located at a distance of 300 yards (280 meters) from the CMR Building would be 3×10^{-4}, or about 1 chance in 3,333 per year.

Involved Worker Impacts

Approximately 210 workers would be at the CMR Building during operations in the event of an accident. Workers near an accident could be at risk of serious injury or death. Following initiation of accident and site emergency alarms, workers in adjacent areas of the facility would evacuate the area in accordance with technical area and facility emergency operating procedures and training.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals used in the CMR Building are both toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the facility are well below the threshold quantities set by the EPA (40 CFR Part 68) and pose minimal potential hazards to the public health and the environment in an accident condition. These chemicals are stored and handled in small quantities (10 to a few hundred milliliters) and would only be a hazard to the involved worker under accident conditions.

4.4.10.3 Intentional Destructive Acts

Analysis of the impacts of terrorist incidents on operations of the CMR Building is presented in a classified appendix to this SEIS. The impacts of some terrorist incidents would be similar to the accident impacts described earlier in this section, while some terrorist incidents may have more-severe impacts. A description of how NNSA assesses the vulnerability of its sites to terrorist threats and then designs its response systems is in Section 4.2.10.3.

4.4.11 Environmental Justice

Operations Impacts—Population estimates of the entire population and minority and low-income subsets of the population have been projected to the year 2030 (see Section 4.4.10.1 and Chapter 3, Section 3.10). As shown in **Table 4–45**, the total population within 50 miles (80 kilometers) of TA-3 under the Continued Use of CMR Building Alternative is projected to receive an annual dose of approximately 0.014 person-rem and an average annual individual dose of 2.7×10^{-5} millirem.

The population subset of nonminority individuals would receive the highest average dose, 3.1×10^{-5} millirem, annually. This dose is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 2×10^{-11}, or 1 chance in about 50 billion, annually. Doses also were estimated for the following population subsets: all (total) minorities, Native Americans, and Hispanics of any race. The total minority population is expected to receive an annual collective dose of 0.0073 person-rem and annual average individual dose of 2.4×10^{-5} millirem. Native Americans living within 50 miles (80 kilometers) of TA-3 would receive a collective dose of 0.00057 person-rem annually and an average annual individual dose of 1.8×10^{-5} millirem. The Hispanic population would receive a collective dose of 0.0052 person-rem annually; the annual average dose to a member of the Hispanic population would be 2.1×10^{-5} millirem. These data show that the dose to all populations surrounding TA-3 would be small and would not result in adverse impacts on human health. Although the annual population dose to the total minority population is projected to be slightly higher than that to the nonminority population, the difference between doses is not appreciable and is because the majority of the population surrounding LANL is considered part of a minority group. Furthermore, the dose to the average individual in the nonminority population is projected to be slightly higher than the projected dose to the average individual in the total minority population.

Table 4–45 Continued Use of CMR Building Alternative — Comparison of Doses to Total Minority, Hispanic, Native American, and Low-Income Populations Within 50 Miles (80 kilometers) and to Average Individuals

	Annual Population Dose (person-rem)	*Annual Individual Dose (millirem)*
Total population	0.014	
Average individual		2.7×10^{-5}
White (non-Hispanic) population	0.0070	
Nonminority average individual		3.1×10^{-5}
Total minority population	0.0073	
Minority average individual		2.4×10^{-5}
Hispanic population [a]	0.0052	
Hispanic average individual		2.1×10^{-5}
Native American population [b]	0.00057	
Native American average individual		1.8×10^{-5}
Non-low-income population	0.013	
Non-low-income average individual		2.8×10^{-5}
Low-income population	0.0013	
Low-income average individual		2.1×10^{-5}

CMR = Chemistry and Metallurgy Research.
[a] The Hispanic population includes all Hispanic persons regardless of race.
[b] The Native American population may include persons who also indicated that they were of Hispanic ethnicity.

Population doses to persons living below the poverty level are also analyzed in Table 4–45. Low-income populations surrounding TA-3 would receive an annual dose of 0.0013 person-rem and an annual average individual dose of 2.1×10^{-5} millirem. Persons living above the poverty level would receive an annual collective dose of 0.013 person-rem and an annual average individual dose of 2.8×10^{-5} millirem.

For nonradiological air quality impacts, as discussed in Section 4.4.4.1, there would be no increases in emissions or air pollutant concentrations for nonradiological releases due to CMR Building or RLUOB operations under the Continued Use of CMR Building Alternative. Nonradiological emissions would remain well below the ambient standards established to protect human health. Therefore, the impact of potential nonradiological air pollutant releases on minority or low-income individuals under this alternative would be considered minor.

Residents of the Pueblo of San Ildefonso have expressed concern that pollution from CMRR Facility operations could contaminate Mortandad Canyon, which drains onto pueblo land and sacred areas. CMRR Facility operations under this alternative are not expected to adversely affect air or water quality or result in contamination of tribal lands adjacent to the LANL boundary.

These data show that the total minority, Native American, Hispanic, and low-income populations would not be subjected to disproportionately high and adverse dose impacts from normal operations under the Continued Use of CMR Building Alternative.

4.4.12 Waste Management and Pollution Prevention

Operations Impacts –The projected annual waste volumes from the CMR Building and RLUOB are listed in **Table 4–46** for transuranic and mixed transuranic wastes, low-level and mixed low-level radioactive wastes, and chemical wastes. The projected volumes for the CMR Building are based on average waste generation rates for the CMR Building for the years 2004 through 2008, while the projected volumes for RLUOB are the same as those shown in Section 4.3.12. (The projected volumes for the CMR Building are smaller than the volumes for these wastes projected for operation of the CMR Building under all alternatives in the 2008 *LANL SWEIS* [DOE 2008a]). The CMR Building and RLUOB are designed and operated to accommodate these waste volumes, and no difficulty in managing these volumes for onsite disposal or shipment for offsite disposition would be expected on either a CMR Building and RLUOB or LANL site-wide basis.

Table 4–46 Continued Use of CMR Building Alternative — Operational Waste Generation Rates Projected for CMR Building, RLUOB, and Los Alamos National Laboratory Activities

Waste	*CMR Building*	*RLUOB*	*Total*	*Site-wide LANL Projections*
Transuranic and mixed transuranic (cubic yards per year)	8.2	0	8.2	440 to 870 [a]
Low-level radioactive (cubic yards per year)	190	130	310	21,000 to 115,000 [a]
Mixed low-level radioactive (cubic yards per year)	1.8	2.3	4.1	320 to 18,100 [a]
Sanitary solid (tons per year) [b]	36	24	60	– [c]
Sanitary wastewater (gallons per year)	2,730,000	2,485,000	5,215,000	156,000,000 [d]
Liquid low-level radioactive (gallons per year)	67,600	95,800	163,000	4,000,000 [e]
Chemical (tons per year) [f]	0.88	0.50	1.4	3,200 to 5,750 [a]

CMR = Chemistry and Metallurgy Research; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Projected waste quantities from LANL operations are given as a range in the *LANL SWEIS* (DOE 2008a). The listed value reflects the assumption of the Expanded Operations Alternative in the *LANL SWEIS*, less the waste projected from some activities that were not implemented (see Table 4–55).

[b] The projected quantity of CMR Building and RLUOB sanitary solid waste (municipal trash) was estimated by multiplying the projected annual number of full-time equivalent radiation workers (140 for RLUOB and 210 for CMR Building) by an assumed annual 344 pounds (156 kilograms) of waste generated per person per year (see Chapter 3, Section 3.12.2).

[c] Annual sanitary solid waste quantities were not projected in the 2008 *LANL SWEIS*.

[d] The value shown is the annual volume of wastewater processed at the Sanitary Wastewater Systems Plant in TA-46, assuming operation at its 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity for 260 working days per year (DOE 2003b). Sanitary wastewater and nonradioactive liquid waste are both projected to be routed to the Sanitary Wastewater Systems Plant for treatment.

[e] The value shown is the projected annual liquid low-level radioactive waste treatment rate at RLWTF assuming implementation of the No Action Alternative in the 2008 *LANL SWEIS*; annual treatment of 30,000 gallons of liquid transuranic waste was also projected (DOE 2008a).

[f] Chemical waste is not a formal LANL waste category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this supplemental environmental impact statement to denote a broad category of materials, including hazardous wastes, toxic wastes, and special waste designated under the New Mexico Solid Waste Regulations.

Note: Totals may not equal the sum of the contributions due to rounding. To convert cubic yards to cubic meters, multiply by 0.76456; tons to metric tons, by 0.90718; gallons to liter, by 3.78533.

Source: DOE 2008a; LANL 2007d, 2009, 2010a.

Radioactive and Chemical Waste

Since the total radioactive and chemical waste volumes listed in Table 4–46 are all smaller than the volumes projected in Section 4.3.12 for the combination of the Modified CMRR-NF and RLUOB and in Section 4.3.12, it was concluded that there would be no significant impacts on available treatment, storage, or disposal capacity expected for the analyzed onsite and offsite waste disposition facilities, a similar conclusion can be made for this alternative.

Sanitary Solid Waste

The CMR Building employs approximately 210 workers (LANL 2011). If each employee generates 344 pounds (156 kilograms) of sanitary solid waste (municipal trash) (see Chapter 3, Section 3.12.2), the

CMR Building would generate about 36 tons (33 metric tons) of sanitary solid waste annually. In addition, about 24 tons (22 metric tons) of sanitary solid waste are projected to result from RLUOB operations annually, or about 60 tons (54 metric tons) from both facilities. This waste would be collected in appropriate waste containers, such as dumpsters, and would be regularly disposed of or recycled by transfer to the Los Alamos County Eco Station located at the Los Alamos County Landfill site within the LANL boundary or by transfer to an offsite solid waste facility permitted to accept the waste. No impacts on available solid waste management capacity are expected because of the small quantity of sanitary solid waste to be managed from CMR Building and RLUOB operations compared to the total quantities of solid waste annually addressed on a county and state basis and the large number of available waste disposition facilities within New Mexico. The annual sanitary solid waste generation from both facilities would represent less than 1 percent of the waste processed in 2009 at the Los Alamos County Eco Station.

Sanitary Wastewater

Under the Continued Use of CMR Building Alternative, the CMR Building would continue to generate sanitary liquid wastewater that would be piped to the Sanitary Wastewater Systems Plant in TA-46 for treatment. Treated wastewater would be pumped to TA-3 to be either recycled at the TA-3 power plant (as makeup water for the cooling towers) or discharged into Sandia Canyon via permitted outfall number 001 (LANL 2010a). The CMR Building sanitary wastewater generation rate is projected to be 2,730,000 gallons for 260 days (10,000,000 liters) per year, assuming that 210 workers each generate 50 gallons (190 liters) of wastewater per day (DOE 2003b). The RLUOB sanitary wastewater generation rate is estimated to be 2,485,000 gallons (9,410,000 liters) per year. The combined wastewater generation rate from both facilities is thus about 5,215,000 gallons (20,000,000 liters) per year. The daily generation rate would represent about 3 percent of the 600,000-gallon-per-day (2.3-million-liter-per-day) design capacity of the Sanitary Wastewater Systems Plant (DOE 2003a). Therefore, no impacts on available sanitary wastewater treatment capacity are expected from CMR Building and RLUOB operations.

Nonradioactive Liquid Waste

The CMR Building would continue to generate industrial wastewater, and it is expected that this wastewater would continue to be transferred to the Sanitary Wastewater Systems Plant for treatment. If the CMR Building continues to generate a few hundred thousand gallons of industrial wastewater annually (see Chapter 3, Section 3.12.1.4), no impacts on Sanitary Wastewater Systems Plant treatment capacity are expected. Similarly, the small quantities of nonradioactive liquid waste that might be generated at RLUOB would be routed to the Sanitary Wastewater Systems Plant for treatment.

Radioactive Liquid Waste

The CMR Building would continue to generate radioactive liquid waste that would be piped for treatment to RLWTF in TA-50. About 67,600 gallons (256,000 liters) per year of liquid low-level radioactive waste have been projected for CMR Building operations and little or no liquid transuranic waste (Balkey 2011). In addition, about 95,800 gallons (363,000 liters) of liquid low-level radioactive waste and no liquid transuranic waste are annually projected from RLUOB operations. About 163,000 gallons (617,000 liters) per year of liquid low-level radioactive waste and little or no liquid transuranic waste are projected from both facilities. The projected volume would represent about 4 percent of the projected RLWTF treatment rate in the 2008 *LANL SWEIS* (under the *LANL SWEIS* No Action Alternative) (DOE 2008a). No impacts on radioactive liquid waste treatment and discharge capacity are expected from CMR Building and RLUOB operations.

4.4.13 Transportation and Traffic

4.4.13.1 Transportation

Routine (Incident-Free) Transportation

Operations Impacts—**Table 4–47** summarizes the total transportation impacts, as well as transportation impacts on two nearby LANL transportation routes: LANL to Pojoaque, New Mexico, the route segment used by trucks from LANL, and Pojoaque to Santa Fe, New Mexico, the route segment used by trucks traveling on Interstate 25 (such as trucks traveling to WIPP). As stated in Section 4.3.13.1, for analysis purposes in this SEIS, two sites, the DOE NNSS and a commercial facility in Utah, were selected as possible disposal sites for all low-level radioactive waste should the decision be made to dispose of low-level radioactive waste off site. Differences in distance to these two sites and the affected population along the transportation routes result in a range of impacts under each alternative.

Table 4–47 Continued Use of CMR Building Alternative — Annual Risks of Transporting Operational Radioactive Materials

Transport Segments	Offsite Disposal Option [a]	Number of Shipments	Round Trip Kilometers Traveled (thousands)	Incident-Free				Accident	
				Crew		Population			
				Dose (person-rem)	Risk [b]	Dose (person-rem)	Risk [b]	Radiological Risk [b]	Nonradiological Risk [b]
LANL to Pojoaque	NNSS	24	1.5	0.009	6×10^{-6}	0.003	2×10^{-6}	5×10^{-10}	0.00003
Pojoaque to Santa Fe		24	2.5	0.02	0.00001	0.005	3×10^{-6}	3×10^{-10}	0.00005
Total Route		24	57	0.3	0.0002	0.1	0.00006	1×10^{-8}	0.0009
LANL to Pojoaque	Commercial	24	1.5	0.009	6×10^{-6}	0.003	2×10^{-6}	5×10^{-10}	0.00003
Pojoaque to Santa Fe [c]		2	0.2	0.004	2×10^{-6}	0.001	8×10^{-7}	2×10^{-10}	4×10^{-6}
Total Route		24	50	0.3	0.0002	0.09	0.00005	1×10^{-8}	0.0008

CMR = Chemistry and Metallurgy Research; LANL = Los Alamos National Laboratory; NNSS = Nevada National Security Site.

[a] Under this option, low-level and mixed low-level radioactive waste would be shipped to either the NNSS or a commercial site in Utah. Transuranic waste would be shipped to the Waste Isolation Pilot Plant.

[b] Radiological risk is expressed in terms of latent cancer fatalities, while nonradiological risk is expressed in terms of the calculated number of traffic accident fatalities.

[c] Shipments of low-level radioactive waste to a commercial disposal site in Utah would not pass along the Pojoaque to Santa Fe segment of highway.

Note: Due to rounding, the risk values may differ slightly from those calculated by multiplying the reported dose times the dose factor of 0.0006 LCFs per rem.

Under this alternative, about 24 offsite shipments of radioactive materials would be made annually to the NNSS in Nevada (or a commercial site in Utah) and WIPP in New Mexico. Maximum transportation impacts would be realized if low-level radioactive waste and mixed low-level radioactive waste were shipped to either the NNSS in Nevada or a commercial site in Utah instead of being disposed of on site. Transuranic waste would be shipped to WIPP. The total projected (one-way) distance traveled on public roads transporting radioactive materials to various locations would range from about 15,500 to 17,700 miles (25,000 to 28,500 kilometers).

The maximum annual dose to the transportation crew from all offsite transportation activities under this alternative was estimated to be about 0.3 person-rem, for both disposal options. The dose to the general population would be about 0.09 to 0.1 person-rem. Accordingly, incident-free transportation would result in a maximum of no (0.0002) excess LCFs among the transportation workers and no (0.00006) excess LCFs in the affected population. The estimated dose associated with transport of low-level radioactive waste and mixed low-level radioactive waste to the NNSS is slightly higher because of the longer distance traveled and larger affected population. The differences in estimated doses under either disposal option are very small.

Note that DOE regulations limit the maximum annual dose to a transportation worker to 100 millirem per year unless the individual is a trained radiation worker. The dose to a trained radiation worker is limited to 2 rem per year (DOE 1999b). The potential for a trained radiation worker to develop a fatal latent cancer from an annual dose at the maximum annual exposure is 0.0012. Therefore, an individual transportation worker is not expected to develop a lifetime fatal latent cancer from exposure during these activities.

The doses to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe were estimated to be a maximum of 0.005 person-rem. This dose would result in no (3×10^{-6}) excess LCFs among the exposed populations.

Transportation Accidents

Operations Impacts—As stated earlier in Section 4.3.13.1, two sets of analyses were performed for the evaluation of transportation accident impacts involving radioactive materials transport: impacts of maximum reasonably foreseeable accidents (accidents with probabilities greater than 1 in 10 million per year [1×10^{-7}]) and impacts of all accidents (total transportation accidents).

For radioactive materials transported under this alternative, the maximum reasonably foreseeable offsite truck transportation accident with the greatest consequence would involve a truck carrying contact-handled transuranic waste. The probability that such an accident would occur is about 1 in 1.5 million (6.7×10^{-7}) per year in a rural area.[16] If such an accident occurs, the consequences in terms of general population dose would be 0.2 person-rem. Such an exposure could result in no (0.0001) excess LCFs among the exposed population. This accident would result in a dose of 8.2 millirem to a hypothetical MEI located at a distance of 330 feet (100 meters) and exposed to the accident plume for 2 hours, with a corresponding risk of developing a latent fatal cancer of about 1 in 200,000 (5×10^{-6}).

Under the Continued Use of CMR Building Alternative, estimates of the total offsite transportation accident risks for all projected accidents involving radioactive shipments, regardless of type, are a maximum radiological dose-risk[17] to the general population of 0.02 person-millirem, resulting in 1×10^{-8} LCFs and a maximum nonradiological (traffic) accident risk of zero (0.003) fatalities.

The maximum radiological transportation accident dose-risk to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, would be 0.03 person-millirem. This dose would result in no (2×10^{-9}) excess LCFs among the exposed populations. The maximum expected traffic accident fatalities along these routes would be zero (0.00005).

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[16] *The likelihood of an accident in an urban or suburban area is much less than 1 in 10 million per year.*

[17] *Dose-risk includes the probability that an accident will occur. Here, these values were calculated by dividing the radiological risks in terms of LCFs given in Table 4–47 (column 9) by 0.0006, which is the risk of an LCF per person-rem of exposure.*

The impacts of transporting various nonradiological materials are presented in terms of distance traveled and numbers of expected traffic accidents and fatalities. This alternative does not include new construction. Therefore, the transport would be limited to the transport of hazardous wastes generated during normal operations, which is expected to be about one shipment per year (see Table 4–35). Based on the travel assumptions described in Section 4.3.13.1, the transportation under this alternative would result in about 330 miles (530 kilometers) traveled, no (0.00001) traffic accidents, and no (0.000001) fatalities.

4.4.13.2 Traffic

Operations Impacts—As the continued CMR Building and RLUOB operations would require the same number of employees as currently working these activities on the site, no changes in traffic are anticipated. There would be no change in the impact on traffic or transportation on the internal LANL road system, the vehicle access portals, or the public roadways external to LANL over the existing conditions.

4.5 Facility Disposition

4.5.1 Impacts of CMR Building Decontamination and Decommissioning

Chapter 2, Section 2.8, describes the contaminated areas, equipment, and systems within the CMR Building and the processes that would be undertaken for building DD&D. For purposes of analysis, only disposition of the entire CMR Building is addressed in detail because activities associated with this option would have the greatest potential environmental consequences, including generation of the largest amount of wastes. DD&D procedures for dispositioning the CMR Building would be common actions across each of the alternatives analyzed in this *CMRR-NF SEIS* (see Chapter 2, Section 2.8.11).

Disposition impacts of the demolition of the CMR Building are discussed qualitatively below for air quality and noise, surface-water and groundwater quality, ecological resources, and human health. Quantitative information has not been presented for these resource areas because project-specific work plans have not been prepared and the CMR Building has not been completely characterized with regard to types and locations of contamination. The waste materials that could be generated by the demolition of the CMR Building are addressed quantitatively, however, as are the impacts of transporting this waste to offsite management facilities; the waste generation and transportation impacts data have been updated since the 2003 *CMRR EIS*. Additional impacts could result from environmental restoration of potential release sites associated with the CMR Building and its vicinity. These potential release sites will be characterized and remediation decisions made in accordance with established processes, including the 2005 Consent Order.

Example potential release sites associated with the CMR Building include the solid waste management units and areas of concern summarized in the following text box.

Example Potential Release Site Associated with the Chemistry and Metallurgy Research Building

Solid Waste Management Unit (SWMU) 03-034(a) consists of two stainless steel and two concrete underground liquid storage tanks located near Wing 9 of the Chemistry and Metallurgy Research (CMR) Building that for a number of years received radioactive liquid waste from Wing 9. A sump pit serving the concrete tanks was used to drain liquid waste to a radioactive liquid waste line to be pumped to the Radioactive Liquid Waste Treatment Facility. Both sets of tanks have been taken offline, and the waste line to the tanks was removed.

Area of Concern (AOC) 03-004(c) is an active dumpster storage area located on an asphalt-covered surface at the main loading dock of the CMR Building, used for staging of boxed low-level radioactive waste before disposal. Runoff from this AOC flows to a storm drain that discharges at an outfall (SWMU 03-054(e)) into Mortandad Canyon. The AOC has been sampled and additional samples will be obtained, leading to a remediation recommendation (LANL 2010g).

SWMU 03-054(e) is an outfall located in upper Mortandad Canyon that discharges effluent from several exterior sources from the CMR Building, including roof drains and surface-water runoff from the asphalt area around the building. The SWMU has been sampled and additional samples will be obtained, leading to a remediation recommendation (LANL 2010g).

Air Quality and Noise

Removal of the CMR Building would result in emissions associated with equipment and vehicle exhaust, as well as particulate emissions (fugitive dust) from demolition activities. Demolition would be expected to result in elevated particulate concentrations in the immediate vicinity of TA-3. Concentrations of other criteria pollutants would increase, but would not be expected to exceed ambient standards in areas where the public has regular access. Demolition activities may also result in radiological releases.

Noise levels during disposition activities at the CMR Building would be consistent with those typical of construction activities. As appropriate and in accordance with DOE regulations (10 CFR Part 851), workers would be required to wear hearing protection to avoid adverse effects on hearing. Noninvolved workers at nearby facilities within TA-3 would be able to hear some of the activities; however, the level of noise would not likely be distracting because construction noise at LANL is common. Some wildlife species may avoid the immediate vicinity of the CMR Building due to noise as demolition proceeds; however, any effects on wildlife resulting from noise associated with demolition activities would be temporary.

Surface-Water and Groundwater Quality

Little or no impacts on water resources are expected. Demolition of the CMR Building would not disturb surface water or generate liquid effluents. Silt fences and other best management practices would be employed to ensure that fine particulates would not be transported by stormwater into surface-water features in the vicinity of the CMR Building. Potable water use at the site would be limited to that necessary for washing equipment, dust control, and worker sanitary facilities.

Ecological Resources

All disposition activities would take place within TA-3, an area that has been dedicated to industrial use since the early 1940s. There are some small trees and shrubs around the CMR Building, but the immediate area consists mostly of roads, parking areas, and concrete pads. Wildlife in the vicinity could be temporarily disturbed by demolition activity and noise when the building is razed, building foundation and buried utilities are removed, contaminated soils are excavated, and waste is trucked to disposal sites.

Cultural Resources

Under Section 106 of the National Historic Preservation Act, any adverse effects on NRHP-eligible properties must be resolved prior to commencement of project activities. In the case of the CMR Building, which has been determined to be eligible for listing due to its association with events during the Cold War years and its architectural and engineering significance (Garcia, McGehee, and Masse 2009), removal of equipment and DD&D of the facility would constitute an adverse effect. In conjunction with the State Historic Preservation Office, NNSA has developed documentation measures to reduce adverse effects on NRHP-eligible properties at LANL. These measures are incorporated into formal memoranda of agreement between NNSA and the New Mexico Historic Preservation Division. Typical memoranda of agreement terms include the preparation of a detailed report containing the history and description of the affected properties. Other terms include the identification of all drawings for each property, the production of medium-format archival photographs, and the preparation of LANL historic building survey forms. Documentation measures included in NNSA memoranda of agreement are carried out to the standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER). Specific levels of HABS/HAER documentation are determined on a case-by-case basis.

Human Health

The primary source of potential consequences to workers and members of the public would be associated with the release of radiological contaminants during the decontamination and demolition processes. The only radiological impact on noninvolved workers or members of the public would be from radiological air emissions. Any emissions of contaminated particulates would be reduced by the use of plastic draping and contaminant containment, coupled with HEPA filtration.

Demolition of the CMR Building would involve the removal of radioactively contaminated and/or asbestos-contaminated material. Asbestos-contaminated material would be removed in accordance with asbestos abatement guidelines. Workers would be protected by personal protective equipment and other engineered and administrative controls. No asbestos would likely be released that could affect members of the public.

Waste Management

All wastes would be handled, managed, packaged, and disposed of in the same manner as wastes generated by other activities at LANL (see Chapter 3, Section 3.12). The amounts and types of wastes are expected to be within the capacity of existing waste management systems and are not expected to impact waste management operations at LANL or elsewhere. Waste minimization and pollution prevention principles would be used to the maximum extent practicable under DOE policy.

Projected annual and total waste quantities per waste type for DD&D of the CMR Building are summarized in **Table 4–48** using a work completion time period of 2 to 4 years.[18] Waste projections are uncertain and have been updated from those presented in the 2003 *CMRR EIS* and 2008 *LANL SWEIS* (DOE 2003b, 2008a) by scaling estimates of contaminated surfaces and equipment (LANL 2003, DOE 2003a) to waste volumes generated from DD&D of known contaminated structures at the former Rocky Flats Plant.

[18] The waste projections do not include wastes that could result from remediation decisions for potential release sites that may be located at or in the vicinity of the CMR Building. These potential release sites will be characterized and remediation decisions made in accordance with established processes, including the 2005 Consent Order.

Transuranic (and mixed transuranic) waste would be generated from DD&D of heavily contaminated ducts, radioactive liquid waste piping, hot cells, conveyors, gloveboxes, hoods, and other equipment. Transuranic waste would be packaged in drums or standard waste boxes and shipped to WIPP in reusable Type B shipping packages certified by the U.S. Nuclear Regulatory Commission. The total WIPP capacity for transuranic waste disposal is set at 6.18 million cubic feet (175,600 cubic meters) pursuant to the Waste Isolation Pilot Plant Land Withdrawal Act (DOE 2002b), or 219,000 cubic yards (168,485 cubic meters) of contact-handled transuranic waste (DOE 2009a). Estimates in the Annual *Transuranic Waste Inventory Report – 2010* indicate that approximately 185,000 cubic yards (141,000 cubic meters) of contact-handled transuranic waste would be disposed of at WIPP (emplaced volume plus stored volume) (DOE 2010b), approximately 36,000 cubic yards (27,500 cubic meters) less than the contact-handled transuranic waste permitted capacity. The projected DD&D total of 150 cubic yards (120 cubic meters) would require less than 1 percent of the unsubscribed WIPP disposal capacity. Note that disposal operations at WIPP are currently approved through 2034, based on its operations permit; however, WIPP may meet its statutory disposal limit before the end of the operational period of the Modified CMRR-NF. If necessary, transuranic or mixed transuranic waste generated without a disposal pathway would be safely stored pending development of additional disposal capacity.

Table 4–48 Continued Use of CMR Building Alternative — Projected Waste Generation from Decontamination, Decommissioning, and Demolition of the CMR Building

Waste Stream	*Annual Waste Generation*	*Total Waste Generation*
Transuranic waste (cubic yards) [a]	38 – 75	150
Bulk and packaged low-level radioactive waste (cubic yards) [b]	9,500 – 19,000	38,000
Mixed low-level radioactive waste (cubic yards) [c]	70 – 140	280
Solid waste (cubic yards) [d]	27,500 – 53,000	110,000
Chemical waste (tons) [e]	65 – 130	260

CMR=Chemistry and Metallurgy Research.
[a] Includes mixed transuranic waste.
[b] Three-quarters of the low-level radioactive waste is projected to be bulk material to be shipped for disposal in soft-sided liners or bags; the remaining waste is projected to be packaged in containers such as drums and boxes.
[c] Expected to principally include asbestos waste contaminated with radionuclides.
[d] Includes demolition debris and sanitary solid waste generated by workers.
[e] Chemical waste is not a formal LANL waste category; however, as was done in the *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2008a), the term is used in this supplemental environmental impact statement to denote a variety of materials, including hazardous waste designated under Resource Conservation and Recovery Act regulations; toxic waste (asbestos and polychlorinated biphenyls) designated under the Toxic Substances Control Act; and special waste designated under the New Mexico Solid Waste Regulations, including industrial waste, infectious waste, and petroleum-contaminated soil. The waste is expected to be principally asbestos waste.
Note: Total may not equal the sum of the contributions due to rounding. To convert cubic yards to cubic meters, multiply by 0.76456; gallons to liters, by 3.78533.
Source: DOE 2003a, 2008a; LANL 2003.

Bulk low-level radioactive waste would be packaged in soft-sided liners and bags and shipped in reusable intermodal containers, while packaged low-level radioactive waste would be packaged in containers such as B-25 boxes or 55-gallon drums. The waste could be transported off site to NNSS or to commercially licensed facilities for disposal and/or disposed of on site at TA-54, while Area G continues to accept waste.

It is expected that the bulk of the low-level radioactive waste generated by the demolition of the CMR Building would be disposed of at facilities at the NNSS; the existing commercial facility at Clive, Utah; or other commercial facilities as they become available. If CMR Building DD&D requires 2 years to complete, the 19,000 cubic yards (15,000 cubic meters) of low-level radioactive waste projected to be generated annually would represent about 30 percent of the average low-level radioactive waste disposal rate at the NNSS and about 9 percent of the current low-level radioactive waste disposal rate at the Clive, Utah, commercial facility (see Section 4.2.12). Considering both facilities, offsite disposal capacity is believed to be adequate.

Mixed low-level radioactive waste would principally consist of asbestos waste contaminated with radionuclides. It would be packaged in containers such as B-25 boxes or 55-gallon drums pending shipment to an offsite treatment, storage, and disposal facility.[19] It is expected that the projected annual generation of mixed low-level radioactive waste would be within the current disposal capacities of the NNSS in Nevada and the commercial facility in Clive, Utah. Using a time period of 2 years, the 140 cubic yards (110 cubic meters) of mixed low-level radioactive waste projected to be generated annually would represent about 9 percent of the average mixed low-level radioactive waste disposal rate at the NNSS and about 2 percent of the current mixed low-level radioactive waste disposal rate at the commercial facility in Clive, Utah (see Section 4.3.12). Furthermore, several additional mixed low-level radioactive waste treatment, storage, and disposal facilities are nationally available.

Solid waste consisting of demolition debris and sanitary solid waste was projected to total up to 53,000 cubic yards (41,000 cubic meters) per year. This waste would be collected in appropriate waste containers such as 20-cubic-yard rolloffs or dumpsters and regularly recycled or disposed of by transfer to the Los Alamos County Eco Station within LANL or to an offsite solid waste facility permitted to accept the waste. No impacts on available solid waste management capacity are expected because of the large number of waste disposition facilities permitted within New Mexico (see Section 4.3.12).

Chemical waste (principally including asbestos that is not radioactively contaminated, but also including polychlorinated biphenyls and Resource Conservation and Recovery Act [RCRA]-regulated hazardous waste) would be packaged in containers such as 55-gallon drums and shipped to offsite recycle or treatment, storage, and disposal facilities. It is expected that the amount of chemical waste generated by demolition of the CMR Building would not exceed the disposal capacity of existing facilities (see Section 4.3.12). Several permitted treatment, storage, and disposal facilities exist within New Mexico and neighboring states; 19 facilities are permitted in New Mexico for disposal of special waste such as asbestos. In addition, 10 permitted treatment, storage, and disposal facilities for hazardous waste existed in New Mexico as of 2008, and 39 permitted companies for treatment or disposal of polychlorinated biphenyls existed in the United States as of 2010.

About 68,000 gallons (260,000 liters) per year of liquid low-level radioactive waste are projected to be generated during CMR Building decommissioning. This waste would be transferred to RLWTF at TA-50 for treatment (Balkey 2011). Liquid waste from decommissioning of the CMR Building has been considered in LANL forecasts for annual receipt of liquid waste at RLWTF (Balkey 2011), and no impacts on RLWTF capacity are expected.

Transportation

Waste from DD&D of the CMR Building would be transported by truck to recycle or treatment, storage, and disposal sites at LANL or offsite locations. Transport of radioactive waste would present potential risks to workers and the public from radiation exposure as the waste packages are transported along roads and highways. There would also be potential public risks from radiation exposure (expressed as LCFs) should hypothetical traffic accidents result in release of radioactive material, as well as nonradiological risks of public fatalities resulting from the mechanical forces involved in an accident. Possible accident risks from transport of nonradioactive wastes would only involve nonradiological public fatality risks.

[19] *Asbestos waste contaminated with radionuclides may also be disposed of at LANL TA-54, while Area G continues to accept waste.*

Table 4–49 lists the estimated annual number of offsite shipments of wastes from DD&D of the CMR Building using an assumed 2-year completion time period.

Table 4–49 Continued Use of CMR Building Alternative — Annual Number of Offsite Shipments of Wastes from Decontamination, Decommissioning, and Demolition of the CMR Building

Number of Shipments				
Low-Level Radioactive Waste	*Mixed Low-Level Radioactive Waste*	*Transuranic Waste*	*Hazardous Waste*	*Nonhazardous Waste*
1,110	10	10	20	2,700

CMR = Chemistry and Metallurgy Research.
Note: Annual shipment estimates have been rounded.

Table 4–50 summarizes total annual transportation impacts, as well as annual transportation impacts for two transportation routes nearby LANL: LANL to Pojoaque, New Mexico, which is the route segment used by trucks to and from LANL, and Pojoaque to Santa Fe, New Mexico, which is the route segment used by all trucks traveling on Interstate 25 (such as trucks traveling to WIPP). For purposes of analysis, the NNSS in Nevada and a commercial facility in Utah were used as possible disposal sites for low-level radioactive waste and mixed low-level radioactive waste if these wastes are all transported to offsite facilities. The differences in distance from LANL and the affected population along the different transportation routes between these two sites result in a range of impacts.

Table 4–50 Continued Use of CMR Building Alternative — Annual Risks of Transporting Radioactive Waste from Decontamination, Decommissioning, and Demolition of the CMR Building

				Incident-Free				*Accident*	
				Crew		*Population*			
Transport Segments	*Offsite Disposal Option* [a]	*Annual Number of Shipments*	*Round Trip Kilometers Traveled (thousands)*	*Dose (person-rem)*	*Risk* [b]	*Dose (person-rem)*	*Risk* [b]	*Radio-logical Risk* [b, c]	*Nonradiological Risk* [b]
LANL to Pojoaque	NNSS	1,130	70.3	0.05	0.00003	0.01	0.00001	9×10^{-10}	0.001
Pojoaque to Santa Fe	NNSS	1,130	117.5	0.09	0.00005	0.02	0.00001	7×10^{-10}	0.002
Total	NNSS	1,130	2,812	1.9	0.001	0.42	0.0003	1×10^{-7}	0.04
LANL to Pojoaque	Commercial	1,130	70.3	0.05	0.00003	0.01	0.00001	9×10^{-10}	0.001
Pojoaque to Santa Fe [d]	Commercial	10	0.8	0.02	0.00001	0.006	0.000004	8×10^{-15}	0.00002
Total	Commercial	1,130	2,423	1.6	0.001	0.4	0.0002	9×10^{-8}	0.04

CMR = Chemistry and Metallurgy Research; LANL = Los Alamos National Laboratory; NNSS = Nevada National Security Site.
[a] For purposes of analysis, low-level and mixed radioactive wastes would be shipped to either the NNSS or to a commercial site in Utah. All transuranic wastes would be shipped to the Waste Isolation Pilot Plant.
[b] Radiological risk is expressed in terms of latent cancer fatalities, while nonradiological risk is expressed in terms of the calculated number of traffic accident fatalities. Radiological risk was determined using a risk of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).
[c] Radiological accident risk in this table is presented in terms of dose-risk, which considers the probabilities that a range of accidents would occur.
[d] Shipments of low-level radioactive waste to a commercial disposal site in Utah would not pass along the Pojoaque to Santa Fe segment of highway.

DD&D of the CMR Building could be completed in as few as 2 years, during which there would be a total of 2,260 offsite shipments of radioactive waste, or an average of 1,130 shipments each year. If DD&D takes a longer time to complete, the annual impacts would be smaller, although the total impacts of shipping all radioactive waste would remain the same. For purposes of analysis, radioactive wastes would be shipped to the NNSS in Nevada (or a commercial site in Utah), and WIPP in New Mexico. The total annual projected (one-way) distance traveled on public roads by trucks transporting radioactive waste would range from about 0.75 million to 0.87 million miles (1.2 to 1.4 million kilometers).

Impacts of Incident-Free Transportation—The annual dose to the transportation crew from offsite transportation of CMR Building DD&D waste was estimated to range from about 1.6 person-rem for disposal at the commercial disposal site in Utah to about 1.9 person-rem for disposal at the NNSS in Nevada. The dose to the general population (up to about 0.4 person-rem) would be nearly the same whether the waste is shipped to the commercial site in Utah or to the NNSS in Nevada. Using a risk of 0.0006 LCFs per person-rem (DOE 2003a), incident-free transportation would result in no (up to 0.001) excess LCFs among transportation workers and no (up to 0.0003) excess LCFs in the affected population. The estimated doses associated with transport of low-level radioactive waste and mixed low-level radioactive waste to the NNSS in Nevada are higher than those for transport to Utah because of the longer distance traveled and larger affected population. The differences in estimated doses under either disposal option are very small, however, as shown above.

Note that DOE regulations limit the maximum annual dose to a transportation worker to 100 millirem per year unless the individual is a trained radiation worker. The dose to a trained radiation worker is limited to 2 rem per year (10 CFR Part 835). Using a risk of 0.0006 LCFs per rem (DOE 2003a), the potential for a trained radiation worker to develop a fatal latent cancer from an annual dose at the maximum annual exposure would be 0.0012. Therefore, an individual transportation worker is not expected to develop a lifetime fatal latent cancer from exposure during these activities.

The maximum annual dose to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, was estimated to be 0.02 person-rem. Using a risk of 0.0006 LCFs per person-rem (DOE 2003a), this dose would result in no (0.00001) excess LCFs among the exposed populations.

The maximum dose to an MEI residing at the edge of the transportation route was estimated to be about 0.0002 millirem per shipment. If this individual were similarly exposed to radiation from all shipments of radioactive waste from DD&D of the CMR Building, the maximum annual dose would be about 0.22 millirem, with a risk of developing an LCF of 1.4×10^{-7} (about 1 in 7.3 million).

Impacts of Accidents during Transportation—As stated in Section 4.2.13, two sets of analyses were performed for the evaluation of transportation accident impacts: impacts of all conceivable accidents (total transportation accidents) and impacts of maximum reasonably foreseeable accidents. The first (probabilistic) analysis takes into account the probability of an accident along the transport route and the potential releases to the environment caused by a spectrum of possible accident scenarios, from low-probability accidents with high consequences (large releases) to high-probability accidents (fender benders) with low or no consequences (small or no releases). The consequences and probabilities are summed over all accident probabilities and severity categories to result in probability-weighted values in terms of dose-risk (person-rem) and risk (LCF). The second analysis (maximum reasonably foreseeable accident analysis) presents the public consequences that would result from a severe accident in an urban or suburban area that has a probability greater than 1 in 10 million per year (1×10^{-7}).

As listed in Table 4–50, the maximum radiological transportation accident risk, reflecting all projected accidents involving radioactive shipments regardless of type, is 1×10^{-7} LCFs using a risk of 0.0006 LCFs per person-rem (DOE 2003a). There would be no (0.04) risk of a fatality from nonradiological (traffic) accidents.

The maximum radiological transportation accident risk to the general population along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, would be 9×10^{-10} excess LCFs among the exposed populations. There would be no (0.001) risk of a fatality from nonradiological (traffic) accidents along these routes.

The maximum reasonably foreseeable offsite truck transportation accident with the greatest consequence would involve a truck carrying contact-handled low-level radioactive waste. The probability that such an accident would occur is about 1 in 667,000 (1.5×10^{-6}) per year in an urban area. If such an accident were to occur, the consequences in terms of general population dose would be about 0.015 person-rem. Using a factor of 0.0006 LCFs per rem or person-rem, such a dose would result in no (9×10^{-6}) excess LCFs among the exposed population. This accident would result in a dose of 0.002 millirem to a hypothetical MEI located at a distance of 330 feet (100 meters) from the accident and exposed to the accident plume for 2 hours. The corresponding risk to the MEI of developing a latent fatal cancer would be about 1 in 793 million (1.2×10^{-9}).

Impacts of Nonradioactive Waste Transportation—Nonradioactive waste includes demolition debris and sanitary solid waste, as well as chemical waste (mostly consisting of asbestos material). This waste would be shipped to recycle or treatment, storage, and disposal facilities within New Mexico or nearby states. The impacts of transporting this waste were determined by estimating the number of possible fatalities that could result from waste transportation accidents. The number of fatalities was determined as the product of the projected distance traveled by the waste trucks annually and the statistical probability of an accident fatality per distance traveled. Based on the assumptions listed in Section 4.2.13.1, transport of nonradiological waste from CMR Building DD&D would result in about 700,000 miles (1.1 million kilometers) traveled, no (0.2) traffic accidents, and no (0.02) fatalities.

4.5.2 Impacts of 2004 CMRR-NF Decontamination and Decommissioning

Disposition of the 2004 CMRR-NF would be considered at the end of its operational life. Impacts would depend on the disposition decision, which could range from reuse to DD&D of the entire 2004 CMRR-NF. If complete DD&D is chosen, it is expected that impacts would be comparable to, or, for many resource areas, smaller than those for DD&D of the CMR Building (see Section 4.5.1). Although similar activities involving radioactive material would be performed, the design, construction, and operation of the 2004 CMRR-NF would incorporate the waste minimization and equipment and operational space decontamination principles that have been learned and implemented since the CMR Building was constructed in the early 1950s. Known hazardous or toxic materials, such as asbestos and polychlorinated biphenyls, also would be avoided or minimized during 2004 CMRR-NF construction and operations, and waste minimization and pollution prevention principles would be implemented. All DD&D activities would be conducted in accordance with applicable Federal and state requirements. Specific resource areas are briefly addressed below.

Air Quality and Noise—There would be air emissions from operation of equipment and vehicles, as well as noise. Airborne emissions of pollutants would likely be smaller than those for DD&D of the CMR Building because known hazardous or toxic materials would be avoided or minimized during 2004 CMRR-NF construction and operations. Noise impacts on humans and wildlife would be temporary.

Surface-Water and Groundwater Quality—Little or no impacts on water resources would result from DD&D of the 2004 CMRR-NF. Applicable best management practices would be implemented to reduce the potential for surface-water impacts.

Ecological Resources—Disposition of the 2004 CMRR-NF would take place in a heavily industrialized area. Any wildlife in the area could be temporarily impacted by disposition activities, but impacts would be minimized in accordance with applicable requirements, including protection of specific species.

Cultural Resources—Cultural resources would be managed and protected in accordance with applicable requirements at the time of DD&D of the 2004 CMRR-NF.

Human Health—Human health would be protected in accordance with applicable Federal and state requirements. Any impacts on workers and the public from disposition activities are expected to be less than those associated with DD&D of the CMR Building because known hazardous or toxic materials, such as asbestos and polychlorinated biphenyls, would be avoided or minimized during 2004 CMRR-NF construction and operations.

Waste Management—Waste quantities from DD&D of the 2004 CMRR-NF are expected to be comparable to or (likely) smaller than those for DD&D of the CMR Building. As noted above, although similar activities would be conducted, construction and operation of the 2004 CMRR-NF would reflect 50 years of experience in facility design and operations, and pollution prevention and waste minimization practices would be implemented. Thus, less radioactive and chemical waste is expected than from DD&D of the CMR Building.

The quantity of nonradioactive waste that is expected from DD&D of the 2004 CMRR-NF is expected to be comparable to that for DD&D of the CMR Building. On one hand, the projected floor space of the 2004 CMRR-NF (200,000 square feet [18,600 square meters]) is less than half that of the CMR Building (550,000 square feet [51,100 square meters]), suggesting the quantity of demolition debris from DD&D of the 2004 CMRR-NF would be less than half of that from DD&D of the CMR Building. On the other hand, the 2004 CMRR-NF might be constructed with thicker flooring and walls than the CMR Building, suggesting that the quantity of waste per unit of floor area from DD&D of the 2004 CMRR-NF would be larger than that for DD&D of the CMR Building. These competing influences suggest that the amount of demolition debris from both DD&D of the CMR Building and the 2004 CMRR-NF would be roughly equivalent.

Transportation—2004 CMRR-NF demolition wastes would be transported to recycle or treatment, storage, and disposal sites at LANL or offsite locations in compliance with applicable requirements. Potential impacts are expected to be similar in magnitude to those for CMR Building DD&D, although there could be fewer radioactive waste shipments because less radioactive waste is expected. Impacts cannot be quantified at this time because potential recycle or treatment, storage, and disposal facilities cannot be identified and population distributions along possible transportation routes are unknown.

4.5.3 Impacts of Modified CMRR-NF Decontamination and Decommissioning

Disposition of the Modified CMRR-NF building would be considered at the end of its operational design life of at least 50 years. Impacts would depend on the disposition decision, which could range from reuse to DD&D of the entire facility. If DD&D of the entire facility is chosen, impacts are expected to be comparable to those described under disposition of the CMR Building (see Section 4.5.1). For the same reasons as those discussed in Section 4.5.2, the quantity of demolition debris under this alternative may exceed that from DD&D of the CMR Building because of the increase in the overall size of the Modified CMRR-NF and the thickness of its walls.

4.6 Cumulative Impacts

In accordance with CEQ regulations, a cumulative impacts analysis includes "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time" (40 CFR 1508.7).

The cumulative impacts analysis for this SEIS includes (1) an examination of cumulative impacts presented in the 2008 *LANL SWEIS*; (2) an evaluation of cumulative impacts since the 2008 *LANL SWEIS* was issued, which are presented in this chapter; and (3) a review of the environmental impacts of past, present, and reasonably foreseeable actions in the region.

Primary sources of information on LANL contributions to cumulative impacts, other than this *CMRR-NF SEIS* and the 2008 *LANL SWEIS*, are listed below:

- *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement*, DOE/EIS-0026-S-2 (DOE 1997b)
- *Environmental Surveillance at Los Alamos During 2008*, LA-14304-ENV (LANL 2010a)
- NOI to Prepare an *Environmental Impact Statement for the Operation of a Biosafety Level 3 Facility at Los Alamos National Laboratory, Los Alamos, New Mexico*, 70 FR 228, November 29, 2005
- *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement*, DOE/EIS-0236-S4F (DOE 2008c)
- *Draft Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste (GTCC EIS)*, DOE/EIS-0375-D (DOE 2011b)

It is also necessary to consider activities implemented by other Federal, state, and local agencies and individuals outside LANL, but within its ROI, including state or local development initiatives; new residential development; new industrial or commercial ventures; clearing land for agriculture; new utility or infrastructure construction and operation; and new waste treatment and disposal activities.

Sandia National Laboratories' main facility in Albuquerque is located approximately 60 miles (97 kilometers) from LANL. Due to this distance, cumulative impacts other than air emissions are not expected to be influenced by Sandia National Laboratories. For radiological air emissions, the 2009 Sandia National Laboratories dose to the offsite MEI was estimated to be 0.00048 millirem, and the 2009 population dose was estimated to be 0.063 person-rem (SNL 2010). The Sandia National Laboratories MEI dose is less than 0.001 percent of the LANL MEI dose, and the Sandia National Laboratories population dose is about 0.002 percent of the LANL population dose. Because the combined impacts would be very small, there would be no significant impact from Sandia National Laboratories, and it is not considered in this cumulative impacts section.

The City of Santa Fe, New Mexico; Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos Counties, New Mexico; the Santa Clara and San Ildefonso Pueblos in New Mexico; the New Mexico Department of Transportation; BLM; and the U.S. Forest Service were contacted for information regarding expected future activities that could contribute to cumulative impacts. The City of Santa Fe and Mora and

Sandoval Counties did not identify any major future actions (Romero 2011, Schiavo 2011, Sena 2011). San Miguel County, Santa Fe County, Taos County, and the Santa Clara and San Ildefonso Pueblos did not provide information for the cumulative impacts analysis. The following activities in the region surrounding LANL were identified:

- Rio Arriba County identified a road construction project involving the repaving of approximately 5.6 miles (9 kilometers) of U.S. Route 64 from Lumberton to Monero, New Mexico. The project is located more than 50 miles (80 kilometers) from LANL (Kilgour 2011).

In addition, Los Alamos County has closed the Los Alamos County Landfill and is considering use of the San Juan-Chama water allotment. Solid wastes are now shipped out of the county via the new Eco Station, which consists of the solid waste transfer station (LAC 2010a). The Bayo Wastewater Treatment Facility in Santa Fe County was replaced in 2007 with an advanced wastewater treatment facility in Pueblo Canyon. The abandoned Bayo Wastewater Treatment Facility will be demolished and the site will be reclaimed for natural open space (LAC 2010b). In December of 2010, the Los Alamos Department of Public Utilities released its "Conservation Plan for Water and Energy," which addresses the supply- and demand-side conservation measures for potable water, electricity, and natural gas. The report states that Los Alamos has reached an agreement with the U.S. Bureau of Reclamation for an additional 1,200 acre-feet, or 391 million gallons (1,500 million liters), per year of San Juan-Chama surface water that is currently inaccessible (LADPU 2010).

A number of projects were identified that would affect the Santa Fe National Forest, including drilling and operating two oil wells, reservoir and dam repair, thinning and prescribed fire, fire salvage, mineral extraction, and grazing allotment (USFS 2010a).

BLM identified smaller projects that would affect BLM lands, such as continued road maintenance, timber harvesting, and grazing permit renewals, as well as larger projects such as the Sandoval County Oil and Gas Lease Sale; *Draft Taos Resource Management Plan*; Mid-America Pipeline Western Expansion Project; Buckman Water Diversion Project; and Windstream Communication's Fiber-Optic Project (BLM 2010b). These larger projects are described below.

- The Sandoval County Oil and Gas Lease Sale involves BLM's offering of two parcels of about 2,500 acres each (1,000 hectares), located in northern Sandoval County between Cuba and Torreon, New Mexico, at the April 2010 oil and gas lease sale. A Finding of No Significant Impact and a Decision Record were signed on February 2, 2010. The plots of land are located approximately 45 miles (72 kilometers) west of LANL (BLM 2010c).

- The *Draft Taos Resource Management Plan* is meant to provide guidance for the management of public lands and resources administered by the Taos Field Office of BLM. When completed, the plan will guide the Taos Field Office in the implementation of all its subsequent management actions and site-specific activities (BLM 2010b).

- The Mid-America Pipeline Western Expansion Project would add 12 separate loop sections to the existing liquefied natural gas pipeline to increase system capacity. A 23-mile (37-kilometer) segment would be placed in Sandoval County, 30 miles (48 kilometers) from the LANL boundary (BLM 2006a). This segment would be constructed parallel to and 25 feet (7.6 meters) away from the existing pipeline right-of-way.

- The Buckman Water Diversion Project diverts water from the Rio Grande for use by the City of Santa Fe and Santa Fe County. The diversion project withdraws water from the Rio Grande approximately 3 miles (5 kilometers) downstream from where New Mexico State Road 4 crosses the river. The pipelines for this project largely follow existing roads and utility corridors. Potential impacts on fish and aquatic habitats below the proposed project due to effects on water flow are minimal (BDDP 2010a; BLM and USFS 2007). An independent peer review was conducted on behalf of the Buckman Direct Diversion Board to obtain an independent analysis and synthesis of existing information to support a description of potential tap water health risks. This review found no risk to human health from drinking water provided by the Buckman Water Diversion Project (BDDP 2010b). A Memorandum of Understanding regarding water quality monitoring between the Buckman Direct Diversion Board and DOE was published on May 12, 2010, establishing the roles and responsibilities of each agency. The memorandum involves DOE's funding of sampling programs and analysis to ensure no contamination enters the water supply, as well as coordination and sharing of data obtained from sampling between both agencies (BDDP 2010a).

- Windstream Communication's Fiber-Optic Project involves adding approximately 21 miles (43 kilometers) of buried fiber-optic cable in Sandoval County. The cable would link the Cuba exchange in the northeast with an existing fiber-optic line in the southwest (BLM 2009a). A Finding of No Significant Impact and Decision Record for the project were released on November 4, 2009. The project is approximately 40 miles (64 kilometers) northwest of LANL (BLM 2009b, 2009c).

Another project would upgrade the existing 46-kilovolt transmission loop system that serves central Santa Fe County with a 115-kilovolt system (PNM 2005). No major new transmission lines are planned for the region around LANL (WAPA 2010).

No new Federal highways are planned within 50 miles (80 kilometers) of LANL (CFLHD 2009). A number of state transportation projects are ongoing or planned. Many of these are relatively minor maintenance, upgrading, widening, and resurfacing projects. Some of the more-substantial transportation projects in the region include the following (NMDOT 2010):

- U.S. Route 84/285 reconstruction from Pojoaque to Española, New Mexico
- New Mexico State Road 502 reconstruction
- Interstate 25 Corridor Study

Although maintenance of the transportation infrastructure in the region would continue and a number of upgrade, expansion, and widening projects are scheduled over the next 5 years or so, no new major highway projects are scheduled that could substantially contribute to cumulative impacts at LANL.

The list of EPA National Priorities List sites (also known as Superfund sites) was reviewed to determine whether these sites could contribute to cumulative impacts at LANL. Only one site is within 50 miles (80 kilometers) of LANL. The North Railroad Avenue groundwater contamination plume is located over 12 miles (19 kilometers) from the LANL boundary in Rio Arriba County (EPA 2010a).

Most of these actions at other sites are not expected to affect the cumulative impacts of LANL activities because of their distance from LANL; their routine nature; their relatively small size; and the zoning, permitting, environmental review, and construction requirements they must meet. Available documentation reviewed to assess cumulative impacts includes the following sources:

U.S. Bureau of Land Management

- *Final Environmental Impact Statement for the Buckman Water Diversion Project* (BLM and USFS 2007)
- An Independent Peer Review and a Memorandum of Understanding for the *Final Environmental Impact Statement for the Buckman Water Diversion Project* (BDDP 2010a, 2010b)
- *San Juan Public Lands (San Juan Field Center & San Juan National Forest) Final Environmental Impact Statement (EIS) Northern San Juan Basin Coal Bed Methane Project* (BLM 2006b)
- Draft Taos Resource Management Plan (BLM 2010a)

U.S. Forest Service

- "Schedule of Proposed Action 1/01/2011 to 3/31/2011, Santa Fe National Forest" (USFS 2011)
- *Decision Notice and Finding of No Significant Impact for the Restoration of Los Alamos Dam and Reservoir* (USFS 2010b)

U.S. Bureau of Reclamation

- *Upper Rio Grande Basin Water Operations Review Final Environmental Impact Statement* (ACE, Reclamation, and ISC 2007)
- *Final Environmental Impact Statement City of Albuquerque Drinking Water Project* (Reclamation 2004)

National Park Service

- *Fire Management Plan for Bandelier National Monument* (NPS 2005)

State of New Mexico

- *2004–2006 State of New Mexico Integrated Clean Water Act §303(d) §305(b) Report* (NMED 2004)
- "State of New Mexico Standards for Interstate and Intrastate Surface Waters" (NMAC 20.6.4)

Most present and reasonably foreseeable future actions planned for LANL were addressed in the 2008 *LANL SWEIS*. In this section, cumulative site impacts are presented only for those resources that were not addressed in the 2008 *LANL SWEIS* and could reasonably be expected to be affected by the preferred alternative. These include site infrastructure, sustainability, air quality, ecological resources, human health effects of normal operations, waste management, and transportation of radioactive materials. Cumulative impacts associated with the remaining resource areas (such as socioeconomics and surface-water quality) would not change from those presented in the 2008 *LANL SWEIS* due to environmental impacts associated with implementing any of the alternatives evaluated in this SEIS. The methodology for assessing cumulative impacts is presented in Appendix B.

Site Infrastructure Requirement Impacts – Implementation of the Modified CMMR-NF Alternative would result in the greatest cumulative infrastructure impacts when added to the projected infrastructure requirements for other LANL activities and the demands of other non-LANL users. **Table 4–51** presents the estimated combined infrastructure requirements during construction of the Modified CMRR-NF in addition to other LANL and non-LANL requirements during the same timeframe. Included in the other LANL site requirements would be the continued operation of the CMR Building. Should these projections be fully realized, LANL and Los Alamos County could cumulatively require 91 percent of the current electric peak load capacity, 57 percent of the total available electrical capacity, 92 percent of the available water capacity, and 27 percent of the available natural gas capacity. In the near term, no infrastructure capacity constraints are anticipated. LANL operational demands to date on key infrastructure resources, including electricity and water, have been below the levels projected in the 2008 *LANL SWEIS* and well within site capacities. For example, actual electric peak load for LANL in 2008 was approximately 63 megawatts compared to the 109 megawatts projected in the 2008 *LANL SWEIS* (LANL 2010a). Inclusion of infrastructure requirements associated with the construction of potential alternatives being analyzed for the *GTCC EIS* at LANL could increase the requirements for electric peak load by 3 percent, electricity by 1 percent, and water by less than 1 percent (DOE 2011b).

Table 4–51 Estimated Combined Infrastructure Requirements at Los Alamos National Laboratory (Construction)

Resource	*System Capacity* [a]	*LANL Current Site Requirement* [b]	*Current Los Alamos County Requirement* [b]	*Available System Capacity*	*Modified CMRR-NF Alternative* [c]	*Remaining Capacity*
Electricity						
Energy (megawatt-hours per year)	1,314,000	563,000	150,000	601,000	31,000–36,000	565,000–570,000
Peak load demand (megawatts)	150	101	23	26	12	14
Natural Gas (million cubic feet per year)	8,070	1,200	1,020	5,860	0	5,860
Water (million gallons per year)	1,807	412	1,241	153	3.8–4.6	148–149

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory.

[a] Data from 2008 *LANL SWEIS*, Chapter 5, Table 5–83, for the No Action Alternative.

[b] Data from Tables 3.4.1-1, 3.4.2-1, 3.4.2-2, 3.4.3-1 of the *SWEIS Yearbook – 2008* (LA-UR-10-03439), with the exception of the Los Alamos County requirement for natural gas, which was calculated using the projected requirement for the No Action Alternative in the 2008 *LANL SWEIS* (Table 5–83) and data from Table 3.4.1-1 of the *SWEIS Yearbook – 2008.* In addition, adjustments were made to reflect higher usage associated with the Metropolis Complex and Material Disposal Area remediation activities as included in the Expanded Operations Alternative in the *LANL SWEIS* (selected in the associated Records of Decision) and exclusion of requirements associated with the 2003 CMRR Facility, as included in the No Action Alternative in the *LANL SWEIS.*

[c] Data from Table 4–15 of this supplemental environmental impact statement.

Note: To convert gallons to liters, multiply by 3.7854.

Source: DOE 2008b; LANL 2011.

Table 4–52 presents the estimated combined infrastructure requirements of operating the Modified CMRR-NF and RLUOB in addition to other LANL and non-LANL requirements during the same timeframe. Requirements to operate the Modified CMRR-NF are higher than those associated with operating either the existing CMR Building (under the Continued Use of CMR Building Alternative) or those estimated for the 2004 CMRR-NF (under the No Action Alternative). Should these projections be fully realized, LANL and Los Alamos County could cumulatively require 100 percent of the current electric peak load capacity, 67 percent of its total available electrical capacity, 92 percent of the available water capacity, and 28 percent of the available natural gas capacity. Of most concern is the potential to exceed electric peak load capacity. Regardless of the decisions to be made regarding the CMRR-NF, adding a third transmission line and/or reconductoring the existing two transmission lines are being studied by LANL to increase transmission line capacities up to 240 megawatts, providing additional capacity across the site. If the proposed TA-50 electrical substation is constructed, it would provide reliable additional electrical power as the independent power feed to the existing TA-55 complex and the CMRR Facility. LANL is also considering establishing an independent power feed to the existing TA-55 complex and the CMRR Facility from TA-3 along existing utility rights-of-way. If additional capacity and reliability can be added to the existing TA-3 substation, this would negate the need to build the proposed TA-50 substation.

Table 4–52 Estimated Combined Infrastructure Requirements at Los Alamos National Laboratory (Operations)

Resource	*System Capacity* [a]	*Current LANL Requirement* [b]	*Current Los Alamos County Requirement* [b]	*Available System Capacity*	*Modified CMRR-NF Alternative* [c]	*Remaining Capacity*
Electricity						
Energy (megawatt-hours per year)	1,314,000 [d]	563,000	150,000	601,000	161,000	440,000
Peak load demand (megawatts)	150 [d]	101	23	26	26	0
Natural Gas (million cubic feet per year)	8,070	1,200	1,020	5,860	58	5,800
Water (million gallons per year)	1,807	412	1,241	153	16	137

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory.

[a] Data from 2008 *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (LANL SWEIS)*, Chapter 5, Table 5–83, for the No Action Alternative.

[b] Data from Tables 3.4.1-1, 3.4.2-1, 3.4.2-2, 3.4.3-1 of the *SWEIS Yearbook – 2008* (LA-UR-10-03439), with the exception of the Los Alamos County requirement for natural gas, which was calculated using the projected requirement for the No Action Alternative in the 2008 *LANL SWEIS* (Table 5–83) and data from Table 3.4.1-1 of the *SWEIS Yearbook – 2008*. In addition, adjustments were made to reflect higher usage associated with the Metropolis Complex and Material Disposal Area remediation activities as included in the Expanded Operations Alternative in the *LANL SWEIS* (selected in the associated Records of Decision) and exclusion of requirements associated with the 2003 CMRR Facility, as included in the No Action Alternative in the *LANL SWEIS.*

[c] Data from Table 4–17 of this supplemental environmental impact statement.

[d] Does not include addition of an electrical substation in TA-50 capable of providing up to another 40 megawatts peak load capacity.

Note: To convert gallons to liters, multiply by 3.7854.

Sources: DOE 2008b; LANL 2011.

Los Alamos County, as owner and operator of the Los Alamos Water Supply System, is now the primary water supplier serving LANL. DOE transferred ownership of 70 percent of its water rights to the county and leases the remaining 30 percent. LANL is currently using approximately 76 percent of its water allotment, and the county is using about 98 percent of its allotment. County concerns about its water availability will be heightened if development plans move forward for construction of additional homes in White Rock and Los Alamos on land that is being conveyed to the county from LANL.

Los Alamos County has implemented a "Conservation Plan for Water and Electricity" (LADPU 2010). In this plan, the county describes a number of steps it has taken to conserve water, including an effluent reuse washwater system associated with the county's wastewater treatment plant that is estimated to conserve approximately 12 million gallons (45 million liters) annually (LADPU 2010). Los Alamos County has the right to use up to 390 million gallons (1.5 billion liters) of San Juan-Chama Transmountain Diversion

Project water annually and is in the process of determining how best to make this water accessible to the county (LADPU 2010). Neither the conservation savings nor the San Juan-Chama water was included in the analysis shown above.

In addition, the use of the Sanitary Effluent Reclamation Facility at LANL may be expanded to include other areas of LANL. Plans are to expand the Sanitary Effluent Reclamation Facility to provide additional treatment to treated effluent from the Sanitary Wastewater Systems Plant to allow the reclaimed water to be used to support the water demands for the TA-3 Power Plant, the Metropolis Center for Modeling and Simulation, and the Laboratory Data Communications Center. Such expansions could save millions of gallons of water annually.

Sustainability—Concern for sustainability of resources is increasing in response to a variety of limiting factors. Not only is the Federal Government responding to this direction, but also state and local governments and private citizens. At every level, conservation and "green" practices and choices are taking hold to conserve natural resources by using them efficiently. DOE has responded to this by adopting policy and issuing directives that require the inclusion of sustainable principles in building design.

As described in Appendix B, Section B.2.3, LANL is responsible for meeting goals for conserving and reducing water and energy use on a site-wide effort. The *LANL Engineering Standards Manual* (ISD 341-2, Chapter 14), *Sustainable Design Guide* (2002) provides direction for energy- and water-efficient design and construction of new and renovated facilities. These closely mirror the principles and strategies embedded in achieving Leadership in Energy and Environmental Design® (LEED) certification under the various U.S. Green Building Council rating systems. Improved performance in new and existing facilities, decommissioning of older facilities, and improving the performance of existing infrastructure are all needed strategies to meet long-term goals for reduced consumption.

As part of its site-wide commitment to sustainability, LANL outlined goals and methods in the *Fiscal Year 2011 Site Sustainability Plan* (LANL 2010e) for managing energy and water needs and controlling its generation of greenhouse gases. The plan balances the need to provide for demands of its specialized nuclear facilities and evolving capabilities with those of achieving sustainability goals site-wide. Some planned projects are specifically aimed at improving supply infrastructure, such as the Sanitary Effluent Reclamation Facility and the planned addition of the electrical substation in TA-50. The plan identifies actions for providing onsite renewable energy systems, such as coordination with Los Alamos County to modify existing utility contracts to allow for purchasing of electricity from photovoltaic sources.

Other measures address pollution prevention and minimization of waste. Measures to achieve this are varied. For example, recommissioning existing heating, ventilating, and air conditioning systems ensure the systems are operating efficiently. Requiring high-performing, sustainable building standards in new construction and major renovations and reducing the footprint of heated space (through demolition of outdated and redundant facilities) will achieve a more-effective use of energy and reduce water use over the long term. Other projects would replace old, inefficient systems and equipment (such as the old steam plant). Bringing on Smart Grid technologies over the next 5 years would manage demand and energy flow, reducing the need to size systems for high peak demands. Implementation of a Sustainable Acquisition Plan and Energy Savings Performance Contracts will require vendors and contractors to provide products and services that meet sustainable criteria for environmentally preferable, non-ozone-depleting, recycled content and nontoxic materials, as well as energy efficiency. The benefits of these changes will take several years to fully realize and will depend on future funding.

The inclusion of LEED certification for new facilities (including the Modified CMRR-NF) is part of the larger effort to reduce energy intensity at LANL and to shift to sustainability. The Modified CMRR-NF incorporates these goals to the extent achievable while meeting other requirements for safety and security. The inclusion of energy- and water-efficient systems and design and the use of environmentally sound materials and construction practices would lessen the anticipated impact of this new facility on achieving site-wide sustainability compared to an equivalent standard facility without these measures.

Air Quality Impacts—The effect of expanded operations at the Modified CMRR-NF under the Modified CMRR-NF Alternative on air quality conditions at LANL would be equal to or higher than those estimated under the Continued Use of CMR Building Alternative because of the higher level of operations in the Modified CMRR-NF and the restrictions on the amount of materials and on operations in the CMR Building. The effect of the Modified CMRR-NF would be well within the levels of concentrations analyzed under the No Action Alternative in the *LANL SWEIS*, which were below the New Mexico Ambient Air Quality Standards and Federal standards for all of the criteria pollutants. As such, LANL would remain in compliance with all Federal and state ambient air quality standards, as shown in **Table 4–53.** Effects on air quality from associated construction and excavation activities would be temporary and localized, as discussed in the air quality sections of this chapter.

Table 4–53 Nonradiological Air Quality Concentration at Technical Area 55 Site Boundary – Operations

Criteria Pollutant	*Averaging Time*	*New Mexico Ambient Air Quality Standards (ppm)*	*Calculated Concentration (ppm)* [a]	*Maximum Facility-Wide Concentration (ppm)* [a]
Carbon monoxide	1 hour	13	0.027	1.2
	8 hours	8.7	0.060	0.22
Nitrogen dioxide	Annual	0.05	1.2×10^{-5}	0.00
Sulfur dioxide	3 hours [b]	0.5	0.10	0.20
	24 hours	0.1	0.01	0.04
	Annual	0.02	5.5×10^{-6}	0.00
PM_{10}	24 hours	150 μg/m^3	1.40 μg/m^3	102 μg/m^3
Total suspended particulates	24 hours	150 μg/m^3	2.4 μg/m^3	135 μg/m^3
	Annual	60 μg/m^3	0.00 μg/m^3	5.7 μg/m^3

μg/m^3 = micrograms per cubic meter; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers; ppm = parts per million.

[a] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[b] New Mexico does not have a standard for sulfur dioxide 3-hour or PM_{10} 24-hour; thus, the Federal standard was used.

Source: DOE 2003a, 2008a.

Greenhouse Gas Impacts—The greenhouse gases emitted by operations at the Modified CMRR-NF and RLUOB would add a relatively small increment to emissions of these gases in the United States and the world. Overall greenhouse gas emissions in the United States during 2008 totaled about 7,775 million tons (7,053 million metric tons) of carbon-dioxide equivalent (DOE 2009b). By way of comparison, annual operational emissions of greenhouse gases from the Modified CMRR-NF and RLUOB would equal about 0.001 percent of the United States' total emissions in 2008. However, emissions from the proposed facility in combination with past and future emissions from all other sources would contribute incrementally to climate change. At present, there is no methodology that would allow DOE to estimate the specific impacts this increment of climate change would produce in the vicinity of the facility or elsewhere.

Ecological Resources Impacts—Most of the construction activities for the Modified CMRR-NF would take place on previously disturbed land with little value as habitat. There would be short-term impacts on non-protected species. Best management practices and implementation measures set forth in the LANL *Threatened and Endangered Species Habitat Management Plan* (LANL 2000a) and supporting documentation would be used during construction activities across the site, including on those associated with the proposed Modified CMRR-NF site and its various support areas (laydown areas, batch plants, spoils areas, parking areas) to minimize the potential for adverse effects on plant and animal communities and on threatened and endangered or special interest species. Proposed construction sites and associated support areas would be surveyed for the presence of special status species, including threatened and endangered species, before construction begins, and appropriate actions would be developed. After construction, temporary structures would be removed and the sites would be regraded and revegetated with native species.

Public and Occupational Health and Safety – Normal Operations Impacts—**Table 4–54** presents the estimated cumulative impacts of radiological emissions and radiation exposure under the 2008 *LANL SWEIS* Expanded Operations Alternative (DOE 2008a), the doses associated with operation of the Modified CMRR-NF and RLUOB under the Modified CMRR-NF Alternative of this SEIS, plus doses associated with the disposal of greater-than-Class C waste at LANL. The estimated doses under the *LANL SWEIS* Expanded Operations Alternative, which reflects the highest level of operations that would be expected to occur at LANL, represent a conservative estimate of the doses that could result from ongoing LANL activities because they include doses associated with the continued operation of the Los Alamos Neutron Science Center (LANSCE) and ongoing remediation of MDAs at LANL. Operation of LANSCE is the predominant contributor to offsite dose to the population surrounding LANL. Remediation of MDAs at LANL is the predominant contributor to worker dose.

Table 4–54 Estimated Cumulative Radiological Impacts from Normal Operations

	Maximally Exposed Individual		*Population Within 50 Miles (80 kilometers)*		*Site Workers*	
	Dose (millirem per year)	***LCF Risk per Year***	***Collective Dose (person-rem per year)***	***Excess LCFs per Year***	***Collective Dose (person-rem per year)***	***Excess LCFs per Year***
LANL SWEIS Expanded Operations Alternative	8.2	4.9×10^{-6}	36	0.022	543	0.33
Modified CMRR-NF Alternative	0.31	1.9×10^{-7}	1.8	0.001	Included above	Included above
GTCC EIS	N/A	N/A	N/A	N/A	5	0.003
Total LANL Dose	8.5	5.1×10^{-6}	37.8	0.023	548	0.33

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LCF = latent cancer fatality; N/A = not available.
Source: DOE 2008a, 2011b.

The Modified CMRR-NF Alternative impacts are expected to be about equal to those that would have been realized from operation of the 2004 CMRR-NF and greater than those associated with continued operation of the CMR Building due to reduced operations at that building. In addition, the *LANL SWEIS* totals include operation of the CMRR Facility, and this analysis does not make any adjustment for a reduction in dose that would be realized when the existing CMR Building is completely shut down. Beyond activities at LANL, no other activities in the area surrounding LANL are expected to result in radiological impacts on the public beside those associated with natural background radiation and other background radiation, as discussed in Chapter 3, Section 3.11.1. The projected dose from continued LANL operations is a small fraction of the dose persons living near LANL receive annually from natural background radiation and other sources such as diagnostic x-rays.

No LCFs are expected for the MEI or the general population. The dose to the offsite MEI is expected to remain within the 10-millirem-per-year limit required by 40 CFR Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." There would be a small increase in the annual risk of an LCF among the general public from LANL operations: from 1 chance in 45 to 1 chance in 43.

If the Expanded Operations Alternative MDA Removal Option were implemented, collective worker doses would average approximately 540 person-rem per year. The addition of impacts from the operation of the Modified CMRR-NF and RLUOB would not change this estimate because the worker dose of approximately 61 person-rem per year was included in the estimate in the 2008 *LANL SWEIS* (DOE 2008a). The 540 person-rem projected dose under the Expanded Operations Alternative in the *LANL SWEIS* corresponds to an annual risk of an LCF in the worker population of 0.3 (or for each 3 years of operation, 1 chance of an LCF in the worker population). Worker doses would decrease by about 140 person-rem per year after the MDA remediation work is completed (DOE 2008a). Inclusion of the *GTCC EIS* (DOE 2011b) estimate for work at LANL, should that alternative be chosen, would add about 5 person-rem per year, but would not increase the annual risk to workers appreciably. Individual worker doses would be maintained as low as is reasonably achievable and within applicable regulatory limits.

The estimated doses shown in Table 4–54 are a very small fraction of the normal background dose received by the population in and around LANL. Chapter 3, Section 3.11.1, of this *CMRR-NF SEIS* provides an analysis of radiation in the environment around LANL that is attributed to external, naturally occurring radiation and radiation from past and present operations at LANL. Natural background radiation was estimated to range from approximately 340 to 580 millirem per year, compared to the estimated doses from LANL operations of 8.5 millirem per year to the MEI and less than 0.1 millirem per year to the average individual living within 50 miles (80 kilometers) of LANL.

Waste Management Impacts—Cumulative amounts of waste generated at LANL would be greatest if the Expanded Operations Alternative described in the 2008 *LANL SWEIS* (DOE 2008a) is fully implemented. This alternative included substantial waste generation rates at LANL, largely due to remediation of MDAs and DD&D of facilities. **Table 4–55** presents the estimated annual amount of radioactive and nonradioactive waste that would be generated at LANL if the Modified CMRR-NF is constructed and DD&D of the existing CMR Building is performed. The Modified CMRR-NF Alternative waste generation rates are expected to be about equal to those that would have be realized from operation of the 2004 CMRR-NF and greater than those associated with continued operation of the CMR Building due to reduced operations at that building. Table 4–55 also includes the revised waste generation estimates associated with DD&D of the CMR Building (see Section 4.5.1).

The contribution to cumulative waste management impacts from other proposed actions at LANL, particularly the overall waste generation at LANL during the next 10 years from the disposition of buildings and environmental restoration efforts, could be large. Construction and demolition wastes would be recycled and reused to the extent practicable. Existing waste treatment and disposal facilities would be used according to specific waste types. The estimated waste generation totals for LANL have been adjusted to reflect the cancellation of the Global Nuclear Energy Partnership program, the decision not to build a Consolidated Nuclear Facility at LANL, and a reduction in the amount of waste associated with building pits at LANL. The Expanded Operations Alternative in the 2008 *LANL SWEIS* included waste associated with the production of 80 pits per year at LANL. NNSA decisions did not include this expansion of pit production at LANL so the waste associated with this expansion has been removed from the 2008 projection.

Table 4–55 Estimated Annual Cumulative Waste Generated at Los Alamos National Laboratory (cubic yards)

Waste Type	*LANL Operations* [a]	**CMRR-NF SEIS** *Modified CMRR-NF Alternative* [b]	*CMR Building DD&D* [c]	*Revised LANL Operations*
Expanded Operations Transuranic Less Manufacturing of up to 80 Pits Less GNEP Less Consolidated Nuclear Facility Less earlier CMR Building Operations Estimate Less earlier CMR Building DD&D Estimate Plus GTCC [d] Revised Total	530 to 3,300 0 to -250 0 to -900 0 to -1,200 -90 0 0 440 to 870	88	38 to 75	570 to 1,030
Low-level radioactive Less Manufacturing of up to 80 Pits Less GNEP Less Consolidated Nuclear Facility Less earlier CMR Building Operations Estimate Less earlier CMR Building DD&D Estimate Plus GTCC [d] Revised Total	27,700 to 141,400 0 to -410 0 to -3,400 0 to -12,000 -2,600 -4,000 to -8,000 5 21,000 to 115,000	2,640	9,500 to 19,000	33,000 to 137,000
Mixed low-level radioactive Less Manufacturing of up to 80 Pits Less GNEP Less Consolidated Nuclear Facility Less earlier CMR Building Operations Estimate Less earlier CMR Building DD&D Estimate Plus GTCC [d] Revised Total	390 to 18,300 0 0 to -4 0 to -72 -30 -38 to -75 0 320 to 18,100	26	70 to 140	420 to 18,300
Construction and Demolition Waste Less earlier CMR Building DD&D Estimate Plus GTCC [d] Revised Total	64,000 to 72,000 -5,000 to -10,000 88,000 147,000 to 150,000	2600	27,500 to 55,000	177,000 to 208,000
Chemical Waste (million pounds) Less Consolidated Nuclear Facility Less earlier CMR Building Operations Estimate Plus GTCC [d] Revised Total	6.4 to 12.9 0 to -1.4 -0.025 0.05 6.4 to 11.5	0.024	0.13	6.6 to 11.8

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; DD&D = decontamination, decommissioning, and demolition; GNEP = Global Nuclear Energy Partnership; GTCC = greater-than-Class C; LANL = Los Alamos National Laboratory.

[a] Data from Table 5–84 of the 2008 *LANL SWEIS* Expanded Operations Alternative divided by 10 to show annual rates, except GTCC.

[b] Data from Table 4–15 of this *CMRR-NF SEIS*, except GTCC.

[c] Data from Table 4–43 of this *CMRR-NF SEIS*, except GTCC. Work to be done over a 2- to 4-year period.

[d] Highest annual data computed from information in Table 5.3.11–1 of the *GTCC EIS* (DOE 2011b).

Source: DOE 2008a; LANL 2011.

Transuranic wastes generated during DD&D of the existing CMR Building would be within the level of impacts forecast under the Expanded Operations Alternative described in the 2008 *LANL SWEIS*. The available capacity of WIPP, or the new capacity of its replacement facility, is expected to be sufficient to accommodate the estimated cumulative volumes of transuranic waste from LANL operations (DOE 2008a). After the adjustments discussed above, site-wide waste projections would be higher for construction and demolition waste than those estimated under the Expanded Operations Alternative in the 2008 *LANL SWEIS* (DOE 2008a) due to the increased waste estimates for DD&D of the existing CMR Building. As described in the 2008 *LANL SWEIS*, low-level radioactive waste generation rates would be substantial under the Expanded Operations Alternative if all waste from MDAs were removed. Offsite disposal options for most of the low-level radioactive waste at LANL include NNSA's NNSS and commercial facilities (LANL 2008a). Mixed low-level radioactive waste generation is also projected to potentially increase, but the quantity would be much smaller than the quantity of low-level radioactive waste generated. Mixed low-level radioactive waste may be sent off site for treatment of the hazardous component and possibly returned to LANL (or elsewhere) for disposal as low-level radioactive waste. For commercial facilities, some restrictions apply to acceptance of waste based on the origin (state of origin and DOE- or non-DOE-generated) and radiological characteristics of the waste.

Significant quantities of nonradioactive solid wastes, including construction and demolition debris, would be generated under the Expanded Operations Alternative if all wastes were removed from MDAs. Demolition of the CMR Building would increase the lower and upper bounds of this estimate based on the latest projections for the amount of this waste that may be generated during the demolition period. Construction of the Borehole Alternative for disposal of greater-than-class C waste at LANL would also increase the generation of solid waste at LANL, should this alternative be implemented. The closure of the Los Alamos County Landfill means that solid wastes would be disposed of via the Los Alamos County Eco Station, where wastes would be segregated and then transported to an appropriately permitted solid waste landfill. Construction and demolition wastes would be recycled and reused to the extent practicable. Debris that cannot be recycled would be disposed of at solid waste landfills or construction and demolition debris landfills.

Radioactive Material Transportation Impacts—The collective doses, cumulative health effects, and traffic fatalities resulting from approximately 130 years (from 1943 to 2073) of radioactive material and waste transport across the United States were estimated in Table 5–85 of the 2008 *LANL SWEIS*[20] (DOE 2008a). The total collective worker doses from all types of shipments (general transportation, historical DOE shipments, reasonably foreseeable actions, and shipments under the 2008 *LANL SWEIS* No Action Alternative) were estimated to be 381,700 person-rem. The total collective doses to the general public were estimated to be 343,680 person-rem, which would result in about 206 excess LCFs among the affected general population. The total estimated traffic fatalities associated with accidents involving radioactive material and waste transports would be up to 119. The majority of the collective doses for workers and the general population would be associated with the general transportation of radioactive material. Examples of these activities include shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level radioactive waste to commercial disposal facilities. The majority of the traffic fatalities would be due to the general transportation of radioactive materials (28 fatalities) and reasonably foreseeable actions (85 fatalities). The estimated doses associated with radioactive material transportation associated with the Modified CMRR-NF under any of the alternatives being considered in this SEIS, and as described in Section 4.3.13, would not change these estimates.

4.7 Mitigation

Following the issuance of a ROD, NNSA is required to prepare a mitigation action plan that addresses any mitigation commitments expressed in the ROD (10 CFR 1021.331). The mitigation action plan would explain how certain measures would be planned and implemented to mitigate any adverse environmental impacts identified in the ROD. The mitigation action plan would be prepared before NNSA would take any action requiring mitigation.

Based on the analyses of the environmental consequences resulting from the proposed action, no mitigation measures would be necessary for many of the resource areas because the potential environmental impacts would be well below acceptable levels of promulgated standards. Activities would follow standard procedures for minimizing construction impacts on air and surface-water quality, noise, operational and public health and safety, and accident prevention. These practices are required by Federal and state licensing and permitting requirements, as discussed in Chapter 5. The 2008 *LANL SWEIS* (DOE 2008a)

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[20] *Included in these estimates for LANL were shipments associated with the CMR Building and the CMRR Project.*

provides a discussion of existing programs and controls at LANL that ensure that construction activities and operations are performed within the constraints of applicable regulations, applicable DOE orders, contractual requirements, and approved policies and procedures. Examples of these programs and controls include the Environmental Surveillance and Compliance Program, the *Threatened and Endangered Species Habitat Management Plan*, the *Cultural Heritage Management Plan*, the NPDES Industrial Stormwater Permit Program, and the Groundwater Protection Management Program.

Public comments indicated concern about water usage and construction traffic. The following paragraphs discuss possible mitigation actions for these, as well as electrical usage.

Although projections indicate that LANL operational demands would remain within the site's annual water use ceiling quantity, total water demand within LANL and Los Alamos County is approaching 92 percent of the county-managed rights to withdraw water from the regional aquifer. Water reduction goals at LANL include reducing the use of potable water by at least 16 percent of the 2007 level by fiscal year 2015. Executive Order 13514 requires a 26 percent reduction in potable water by fiscal year 2020, as well as a 20 percent reduction in industrial, landscaping, and agricultural water use by fiscal year 2020 from a fiscal year 2010 baseline. In light of these goals, the CMRR Project is investigating the use of treated effluent water in construction activities.

With the additional projected demands of the Modified CMRR-NF, peak electrical power demand would be at the current capacity. Independent of a decision on the CMRR-NF, adding a third transmission line and/or reconductoring two existing lines to increase transmission capacity to LANL and Los Alamos County are being studied. One or both of these actions, plus construction of the proposed TA-50 substation or providing another power feed from the TA-3 substation, would add the capacity to meet the peak power demand.

Construction of the Modified CMRR-NF would affect both traffic on the roads around LANL and on site. There would be up to 790 construction workers during the peak construction period under both options of the Modified CMRR-NF Alternative. Under this alternative, construction workers would park their personal vehicles in a parking lot to be built in TA-72 and would be shuttled by bus to the construction site. Scheduling work shifts and transportation of construction materials to off-peak times may alleviate traffic congestion if that becomes a problem. In addition, lighting in the parking lot could be turned off at night when not required by workers to mitigate light impacts on nearby areas.

4.8 Resource Commitments

This section describes the unavoidable, adverse environmental impacts that could result from the proposed action; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and irreversible and irretrievable commitments of resources. Unavoidable, adverse environmental impacts are impacts that would occur after implementation of all feasible mitigation measures. The relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity addresses issues associated with the condition and maintenance of existing environmental resources used to support the proposed action and the utility of these resources after their use. Resources that would be irreversibly and irretrievably committed are those that cannot be recovered or recycled and those that are consumed or reduced to unrecoverable forms.

4.8.1 Unavoidable, Adverse Environmental Impacts

Implementing the alternatives considered in this SEIS would result in unavoidable, adverse impacts on the human environment. In general, these impacts would come from incremental impacts attributed to the operations of either the existing CMR Building or a CMRR-NF at TA-55.

CMRR-NF and RLUOB operations at LANL would have minimal unavoidable, adverse impacts related to air emissions and greenhouse gas emissions. Air emissions would include various chemical or radiological constituents in the routine emissions typical of nuclear facility operations, although CMRR-NF and RLUOB activities would not release major emissions to the atmosphere at LANL. Air emissions at LANL would occur regardless of CMRR-NF and RLUOB activities. These impacts have been addressed in various LANL NEPA documents. Overall air quality at LANL would not be changed by implementing any of the alternatives analyzed in this SEIS.

Operations at the existing CMR Building or the CMRR-NF at TA-55 would result in unavoidable radiation exposure to workers and the general public. Workers would be exposed to radiation and chemicals associated with analytical chemistry and materials characterization, uranium processing, actinide research, processing and fabrication, and metallography. The incremental annual dose contribution from operations at the existing CMR Building or the CMRR-NF at TA-55 to the offsite MEI, general population, and workers is discussed in Sections 4.2.10, 4.3.10, and 4.4.10.

The generation of radioactive and nonradioactive waste would be unavoidable. Any waste generated during operations would be collected, treated, stored, and eventually removed for suitable recycling or disposal in accordance with applicable EPA regulations.

The decontamination and decommissioning of the CMR Building would result in the one-time generation of radioactive and nonradioactive waste material that could affect storage requirements. This would be an unavoidable impact on the amount of available and anticipated storage space and the requirements of disposal facilities at LANL or off site.

Temporary construction impacts associated with the construction of the CMRR-NF at TA-55 would also be unavoidable. These impacts would include the generation of fugitive dust; noise; associated greenhouse gases; increased construction vehicle and worker traffic; temporary disruption of habitat for non-protected species; and the use of resources, including land, mineral, and energy resources.

4.8.2 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of any of the proposed alternatives, including the No Action Alternative, would cause short-term commitments of resources and would permanently commit certain resources (such as energy). Under each alternative, the short-term use of resources would result in potential long-term benefits to the environment and the enhancement of long-term productivity by decreasing overall health risks to workers, the public, and the surrounding environment by reducing their exposure to hazardous and radioactive substances.

Under the proposed action, overall CMRR-NF and RLUOB operations would not change from those operations described in the 2008 *LANL SWEIS* (DOE 2008a) for the existing CMR Building. The short-term use and commitment of environmental resources under the No Action and Modified CMRR-NF Alternatives would include the use of space and materials required to construct the new building, the commitment of new operations support facilities, transportation, and use of other consumable resources and materials for CMR operations. Workers, the public, and the environment would be exposed to increased amounts of hazardous and radioactive materials over the short term from the relocation of CMR Building operations under these alternatives and the associated materials, including process emissions and the handling of waste from equipment refurbishment.

Regardless of the alternative selected, air emissions associated with either the existing CMR Building or the CMRR-NF and RLUOB would introduce small amounts of radiological and nonradiological constituents to the air of the regions around LANL. These emissions would result in additional air pollutants and exposure, but would not impact compliance with air quality or radiation exposure standards at LANL. There would be no significant residual environmental effects on long-term environmental viability.

The management and disposal of sanitary solid waste and nonrecyclable radiological waste over the project's lifespan would require a small increase in energy and space at LANL treatment, storage, and disposal facilities or their replacement offsite disposal facilities. Regardless of the alternative selected, land required to meet the solid waste needs would require a long-term commitment of terrestrial resources.

Continued employment, expenditures, and tax revenues generated during the implementation of any of the alternatives would directly benefit the local, regional, and state economies over the short term. Long-term economic productivity could be facilitated by local governments investing project-generated tax revenues into infrastructure and other required services.

The short-term resources needed to construct and operate the CMRR-NF and RLUOB at LANL would not affect the long-term productivity of LANL. Workers, the public, and the environment could be exposed to increased amounts of hazardous and radioactive materials over the period of construction due to relocation of materials, including process emissions, and handling of radioactive waste.

4.8.3 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable commitments of resources under each alternative potentially would include land, mineral, and energy resources during the lifespan of the project and the energy and water used during operations.

Energy expended would be in the form of fuel for equipment and vehicles, electricity for facility operations and construction (under some alternatives), and human labor. CMRR-NF construction and CMRR-NF or CMR Building and RLUOB operations would generate nonrecyclable waste streams, such as radioactive and nonradioactive solid waste and some wastewater. Construction of CMRR-NF would consume large quantities of construction materials such as steel, sand, gravel, flyash, and cement. However, certain materials and equipment used during construction and operations could be recycled.

Land would be used for both the construction of a new facility and the disposal of hazardous and radioactive waste. The commitment of land for the new facility is discussed in Sections 4.2.1, 4.3.1, and 4.4.1.